

# Translating Domain Expertise through Visual Sensemaking.

by George Shewchuk

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## **Abstract**

Visual (graphic) designers lead their work with the creation of artifacts for presentation and dissemination of concepts, information and marketing propositions. Their process is governed by a dialectic between sensemaking and strangemaking methods that facilitates their understanding of a problem space. Visual thinking-models developed first as sketches, facilitate the creation of final, carefully rendered artifacts. The aim of this paper is to expose and mine these processes and techniques for their deeper sensemaking utility. For my case study I chose to focus on the outcomes from research that was conducted by the Alzheimer Society of Ontario and their partners. Their research was designed to engage various stakeholders in the creation of visualizations that capture the essential features of the “dementia journey”. The resulting visual metaphors were then critically examined and restructured by employing my visual design expertise, visual design principles and with reflection on participant response in semi-structured interviews. The new visual interpretation was developed through both a sensemaking and strangemaking lens that inform final illustrations. The subjective techniques a visual designer uses to create artifacts can be loosely correlated to objective visual design principles, thereby combining the visual novelty and impact of strangemaking, as in making the familiar highly differentiated, with the convergence on shared meaning of sensemaking. Nigel Cross (1982) formally describes this as “designerly ways of knowing”. I conclude that the visual thinking process, as a subset of a strangemaking mind-set, has valuable and under-utilized sensemaking features that aid in the comprehension of a problem space and clear the way for creative discovery.



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# INTRODUCTION

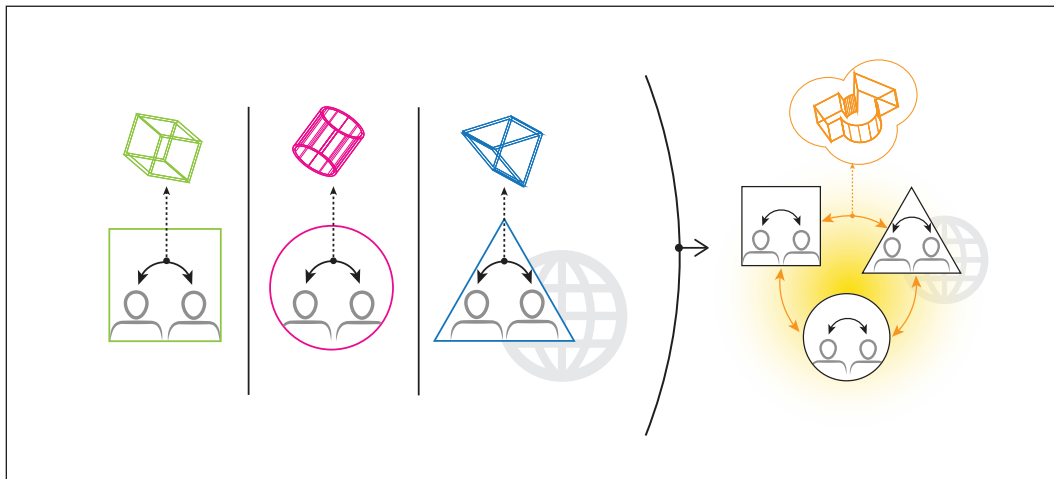
The democratization of digital tools, the ubiquitous inter-connectivity to things and ideas, lightening-speed access to information and sharing insights from across the globe is a modern-day crucible for the generation of real innovation. At a local scale, when we eliminate the organizational silos of productive activity, we create new connections and conduits for sharing knowledge. As these connections breach traditional organizational boundaries, reaching into new domains or new communities of practice, the need for a common language between all actors becomes even more critical. Effective cross-pollination of ideas relies on communicating heterogeneous experiences, aligning idiosyncratic behaviors and expressing unfamiliar concepts.

With the advent of greater complexity and more intractable problematic situations, collaborative work within multidisciplinary teams is essential. Being well-versed in a particular domain and adroitly expressing ideas are necessary but not sufficient qualities for the creation of effective and innovative solutions. Non-linguistic based exploration and problem-solving methodologies need to be more fully integrated into the way people really communicate and behave. The linearity of language and its naturally discursive qualities are not always robust enough to capture the essential properties of complex problems (Ware 2008). Any attempt to oversimplify complexity destroys the very elements, connections and emergent properties that are necessary to fully comprehend the problem space and ultimately to find sustainable innovative solutions. Championing creativity, independent and interdependent thinking in all forms increases the chances of finding novel and more productive approaches to complex problems that can not been

developed using only traditional channels or team structures. Organizations that reach out beyond the “job description” with its concomitant list of requisite skills have realized that effectively addressing complex problems requires a blend of diverse cognitive, emotional and social attributes in their members that are not bound by demographics or even geography (Figure1). The teams they create are populated with participants that exhibit this variety of life and learning experience<sup>1</sup>.

## Organizational Innovation

The boundaries between silos of practice within an organization are under severe pressure to perform with greater efficiency, locally across the entire organization and throughout their global networks. The goal of organizational innovation is to distribute the capacity and the skills for finding sustainable solutions to complex problems across individual teams and throughout the entire organization itself.



*Fig. 1: The rise of culturally and intellectually diverse team structures*

<sup>1</sup> IDEO is a good example of such an organization: “[they look for] people with at least one deep area of expertise and a broad reach of other skills and experiences to draw on...” Their work force is a “mosaic of individuals”. Retrieved from IDEO’s FAQ on new hires: <http://www.ideo.com/careers/faq>

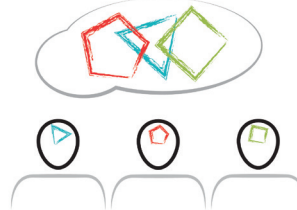
We are inundated with anecdotes describing the mysterious machinations behind the giant innovators and team leaders of our times. Despite the careful review of “best practices” and even after the extraction of various principles gleaned from real-world examples, it is virtually impossible to prescribe any one method over another that will lead to innovation. To use a technical metaphor, “software” cannot be simply copied to the hard drive and then be expected to work. It needs to be initiated and “loaded” into various partitions within the central processing unit according to a specific set of rules. The same kind of principle would apply to learning about the methods of innovators around us. Their experiences from birth, their nature and how they are nurtured is wholly unique. We can not replicate the entire process, only copy a few of the more visible steps (Revell 2008). It is never about one thing, but the effect of the whole, the environment and the needs of every member in diverse stakeholder community.

From the perspective of a visual design methodology, my research investigates how visual thinking processes include a rich sensemaking-strangemaking cycle during the development of artifacts through rapid sketching and the production of multiple iterations. I emphasize and demonstrate the importance of productive visual thinking practiced by graphic designers as a means by which other team members on an organizational scale can facilitate comprehension, synthesize information and create new insights. The research questions that follow identify the key mileposts for my inquiry.

## Research Questions

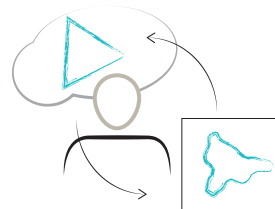
The research project sought to address three research questions, in the following order of emphasis as presented. Throughout the research process, the exact formulation of these questions shifted to better address the actual data collected.

*1. How might visual translation and expression aid the sensemaking of domain experts?*



Domain experts in the healthcare industry face extraordinarily complex challenges in the development of sensemaking artifacts that need to be accessible to a diverse range of stakeholders. “If sensemaking is viewed as an act of invention, then it is also possible to argue that the artifacts it produces include language games and texts” (Weick, 1995). By extension we can say that sensemaking also produces artifacts as visualizations. Graphical communication and visual expression assists the sensemaking of domain experts. “Critical to the success of redesigning the care process is the involvement of all stakeholders and their commitment to actively participate in the process” (Curry, McGregor & Tracy, 2006).

*2. How might visual design practices lead to new insights as discoveries in the sensemaking process?*

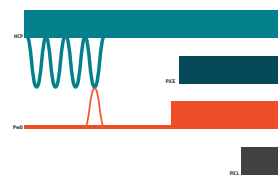




If we take the view that sensemaking begins with the individual, then the visual thinking exhibited in the sketching process of designers is one way they learn about the problems they need to solve. Weick (1995) notably said “How can I know what I think until I see what I say?” We could interpret this visually to mean that we must actually “see what we say” to “know what we think.” Even the most tentative and loosely rendered image can be seen as an iterative mirror of feedback, which validates the relative truth of an idea with its originator or only the sketcher himself. Sharing this process with others may generate more intersections and combinations of perspectives, encouraging the discovery of new insights.

The discursive nature of prose and speech may actually inhibit the naturally unpredictable features of abductive reasoning and insight generation (Kolko, 2010). These are in fact the “aha” moments that escape linear discussion or thought patterns. Discourse peppered with “umms”, “aws”, pregnant pauses and defaults to expressions in the form of jargon and clichés hinder comprehension and obfuscate potential insights. “[F]raming needs to be explorative and interactively co-created, [it needs] a new language that support this” (Paton & Dorst 2011). The strangemaking-sensemaking cycle that visual designers use when developing ideas have an inherent power to drive creative discovery. “Sketches can simulate creativity....by providing new directions for idea generation in an individual generate-interpret cycle” (Van der Lugt 2005).

*3. How might visual representational principles help illustrate the meaning and function of complex relationships in systemic problem areas?*



The underlying mechanisms of visual thinking (for professional designers) are for the most part hidden and difficult to identify (Ware 2004). The “principles” appear to spring forth from the accumulated knowledge and experiences of the designer. By stating “out loud” that a visual technique or design convention will be explicitly applied to information or research findings in the way that de Bono (1999) suggests that teams can consciously structure their thinking to achieve novel results, perhaps can we also “force” conventional visual design practices to inform a collective sensemaking process.

## BACKGROUND

### Visual Sensemaking

From the visual design practitioner’s perspective, the success and vital function of their practice centers on creating visuals that have major roles in the facilitation of idea generation and the presentation of information (Ware, 2008, Tufte, 2006). They are also tasked with producing evocative (strangemaking) artifacts for the dissemination of this information to new stakeholder groups (Figure 3).

#### *1. Facilitation*

Visual facilitation is the immediate representation for ideation that prefaces a formal design process which produces “finished” artifacts. The initial visual artifacts take the form of heuristic sketches and aid in conceptualization and expression of ideas. Identified

by Seligmann and Feiner (1991) heuristic sketches are “ad-hoc graphic formats [that] can be quickly and collectively changed and thus propagate the rapid and joint improvement of ideas.” These “sketches dominate the early ideation stages.” (Buxton, 2007) Visual expression through sketching in architectural domains is also a common method for inciting discovery and communicating potential “massing” configurations and design elements (Figure 2).

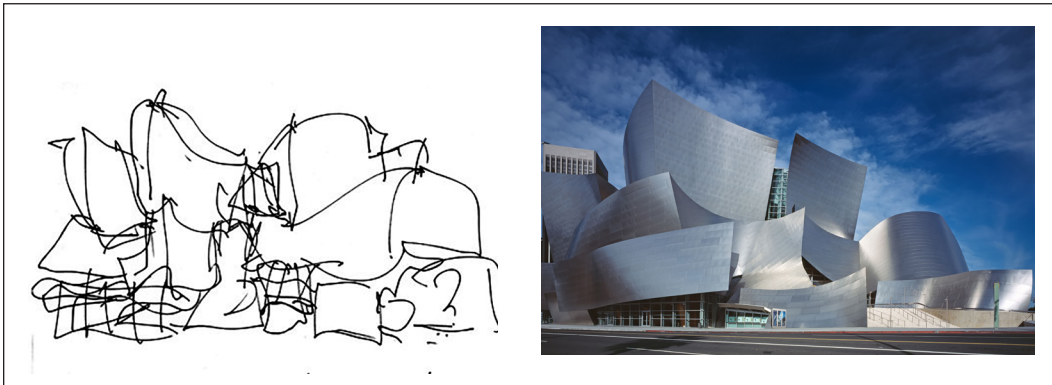


Fig. 2: Frank Gehry's massing sketch (to get an immediate sense of potential shapes and proportion) for the Disney Concert Hall (photo: Carol M. Highsmith 2005 creative commons)

## 2. Presentation

Visual artifacts have an important role in the presentation of knowledge to communicate evidence and findings to other stakeholder groups. Presentation as a display of evidence, *assists thinking* for both the producer and the consumer of the display (Tufte, 2006).

When information is shared it is exposed to the critical thought process of others thereby initiating dialog and critique. When reflecting on data, “intense seeing” (Tufte, 2006) uncovers relevant and rich patterns which ultimately need to be shown in order to be shared. *Intense showing* is perhaps a corollary to this idea which would involve the rhetoric of persuasive communication and story telling techniques. Tufte also asserts that intense seeing is a process that is necessary for both artistic and scientific endeavors, echoing

Arnheim's (1972) assertions that art has much in common with science in that both disciplines are after qualitative facts.

"The commonality between science and art is in trying to see profoundly - to develop strategies of seeing and showing" (Tufte, 2006).

### *3. Dissemination*

When visual artifacts are used in the dissemination of knowledge that reaches beyond the key stakeholder group or problem-solvers (and problem-owners) to a broader audience the main objective of the visual design and its artifacts is to "clarify and embody" concepts (Ware, 2008). Dissemination of knowledge may also be reduced to the more visceral and practical communication of product and service features created by marketing and advertising firms. The first order of concern for these organizations is "differentiation". To remain viable the messages they design for their clients must stand apart from their client's competitor's.

Ware (2004) asserts that visual representations abide by a very different grammar than linguistic (linear) forms of expression and that they are more concerned with the discovery of pattern relationships. Using a visual language is especially productive at the front end or problem-finding stage of the design thinking process. Ware (2008) talks about visualizations that are the result of sketching, as a kind of "meta-seeing". The sketch is directly informed by the marks made on a surface, it guides exploration of the image beyond merely reproducing mental constructs in the sketcher's mind. This is also how "heuristic sketches" find life. They have a fuzzy beginning that is fuelled by tacit knowledge and the embodied experiences of the sketcher (Seligmann & Feiner, 1991).

Sevaldson (2011) suggests that rule-based visual design practices as guided by the conventions of drawing and imaging software with their inherent limitations, should be combined with “generative diagrams” which he describes as being qualitative in their communicative role and intuitively informed. The *generative diagram* is Sevaldson’s heuristic sketch. It is this tension between a structured “illustration” as a finished image rendered with the computational power and precision of a software program and the *intuitively driven heuristic sketch* that creates a vital sensemaking opportunity for collaborative teams working on complex problems. The conventions embedded in drawing software with their explicit design rules may take one into an unexpected territory of thought and design. The dialectic between the computer aided drawing and the intuitive nature of a sketching process is the heart of the visual designers methodology.

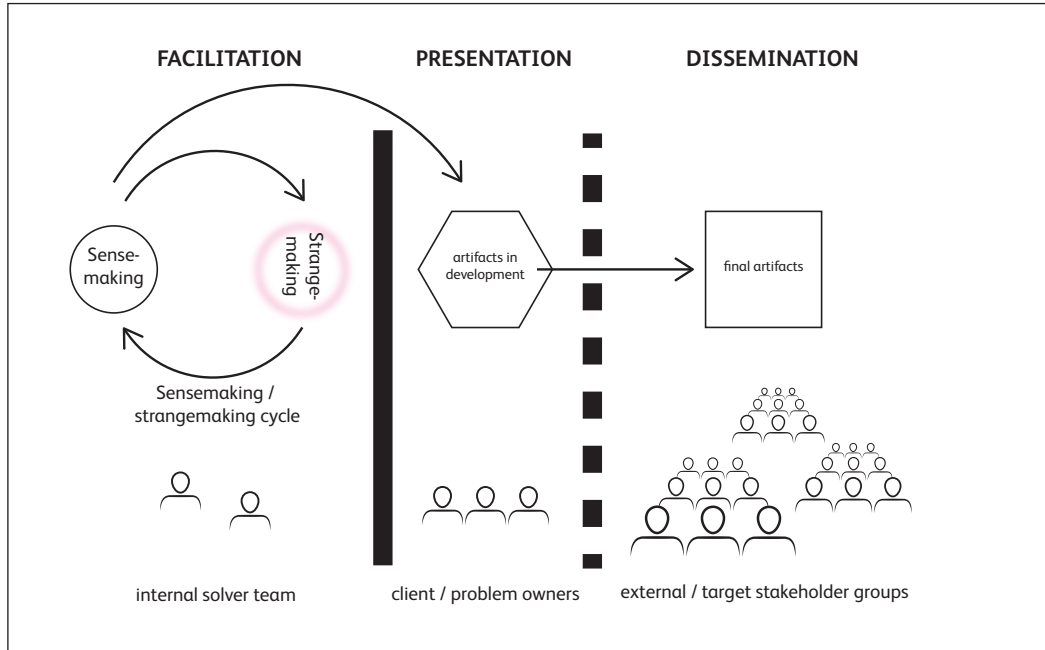


Fig. 3: The limitations of existing silos of activity within an organization that produces visual and experiential artifacts for communication

McKim (1972) also highlights an important feature of the “artist’s” mind-set, that of relaxed attention, contemplation and meditation before focus, which he suggest enhances effective visual thinking. Meditation and contemplation in terms of a design thinking protocol is akin to the incubation period that follows the data gathering step. These recurring parallel actions between structured analysis and free-form intuition as a collaborative sensemaking tool is a central theme that this paper explores.

## What is Creative Visual Thinking?

At the very moment a mark is intentionally made on a surface, a thought process begins (Arnheim, 1972). This is thinking out-loud on paper or visual thinking. It is both the action of the body (hand with drawing implement) and the motivation to express something that begins a dialog with a surface. There is also an inherent “*not-always-knowing-what-one-is-doing*” quality to the action when sketching in this way (Sevaldson, 2011). Interaction with this mode of cognition is immediately accessible to everyone within a sight-line of the sketching activity. They are literally seeing inside the sketcher’s head. Visual thinking, by its very nature, can be expansive, exuberant and very messy but it is deeply expressive and fertile. The *language of the line* (Tufte & Druckery, 2012) is part of a very personal dialog. It is a sensual connection from the brain to the hand and to a digital or analog interface and finally to a surface. It is a powerful and expeditious way to unearth tacit knowledge that allows the participants to be uninhibited and free in their thought process.

Visual thinking can be a wholly externalized process. The “house trace” exercise (Figure 4) for example, challenges one to keep the pencil tip on the surface of the paper

and not re-trace any lines to complete the shape. The solution is not found anywhere else but by trial and error with pen on paper. It is possible to “imagine” the solution too but at the centre of this problem is an externalized process of visual thinking (see solution, Appendix A). Visual thinking is ordered by an invisible syntax. The connections between shapes, the choice of colours or line weight feel random and arbitrary, but what actually happens on a surface is the *actual thinking* (Sevaldson, 2001).

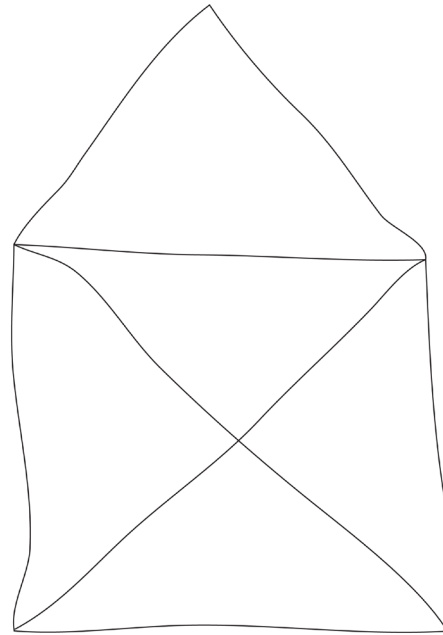
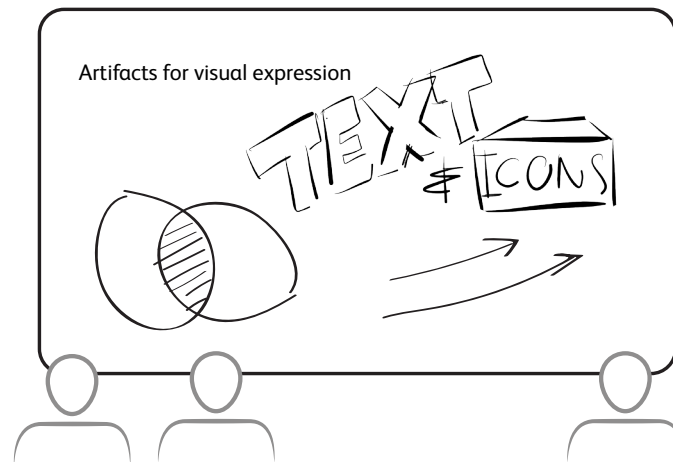


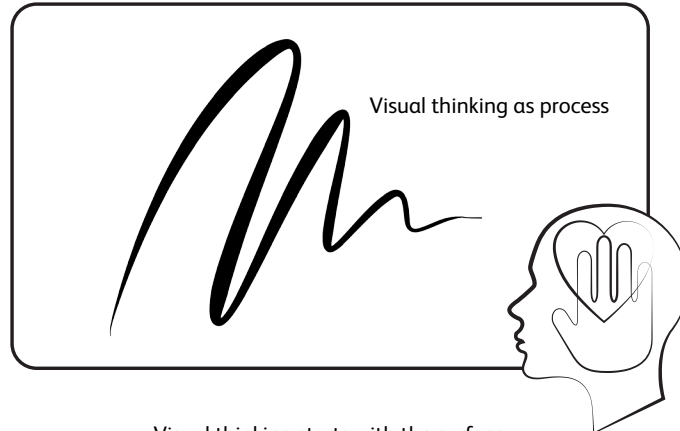
Fig. 4: House trace

Mental models as artifacts may be constructed using conventional metaphors or signs that make up a visual lexicon (Figure 5). These typically include basic directional vectors to identify time-lines or to indicate influence (arrows), areas of shared meaning or co-dependency (the intersection of the ubiquitous Venn diagram) and so on. But visual *thinking* as an extra-linguistic activity escapes being identified with a set of conventional signs or symbols. Visual thinking as such, is a conversation with the marks on the page. The “doing” (drawing and sketching) *is* the thinking, “doing and thinking are complementary” (Schön, 1983). The enormous value of *thinking-out-loud-visually* arises out of the sheer freedom one has to think, without being confined to a formal lexicon or syntax.

## Artifact versus Process



Visual recording or collaborative visualizations, are a way of sharing information. Visualizations capture or reflect meaning with iconography and text.



Visual thinking starts with the surface.  
The first mark may only be representative of a feeling as a manifestation of intuition.  
Its "meaning" or relevance beyond that is not immediately known.

*Fig. 5: Demonstrating the essential difference between visual recording and visual thinking*



## How Traditional Visual Designers Work

The professional process of visual design is largely an invisible one. It is a process that is described after the fact in a presentation to a client or during a discussion with peers. The process as it unfolds before the practitioner's eyes appears to be mysterious, it moves forward in spurts and starts. It is often a fortunate surprise both to the designer teams, individual practitioners and the client.

*"... A second and 34 years "* is how Paula Scher (Curtis, 2011) described her process when she designed a visual identity for a multinational financial services corporation (Figure 6). In her own words, her work is a result of making tangible an intuitive response to a tightly framed design problem

through rapid sketching. This is just the tip of the iceberg, the rest of her process remains invisible. It is the accumulated skill and tacit knowledge of a visual thinker amassed over the entire course of her career. The rationale is often developed after the fact and accompanies the final presentation to satisfy the client's protocol and to



*Fig. 6: Paula Scher's sketch for "citi" 1998*

justify the fees. This may be a grand testament to her skill but it is one that is expressed as an individual. The problem she faced had very tight constraints: find a transition from

an existing logo (Travellers) to the re-branding and renaming to “citi”. This is essentially just an exercise in “differencing” (VanPatter, 2009) which addresses the client’s need to differentiate themselves from the competition.

Traditional visual designers are working with manufactured problems that are clearly framed and with the solution areas predetermined. They operate under the assumption that if a problem is “*well put [then it is] half solved*” (Dewey, 1910). In complex socio-technical systems the problem statement is never that clear. Finding the right problem to solve was outside Scher’s purview. As a visual designer she would not need to consider the other forces that may challenge the viability of *citi*<sup>1</sup> 5 years hence. The need for a new “look” and brand has little to do with complexity of their industry sector. Graphic and communication designers are handed a predefined road map where the solution space is established in the brief.

Jones and van Patter (2009) define four domains of design practice that advance from those disciplines that involve individual skill (Design 1.0) through contemporary product and service design project teams (2.0) wherein multiple designers are needed, to socially complex domains (3.0 and 4.0) where only stakeholders can inform design and designers are sensemakers. Designers in the 1.0 domain work with a process that is invisible to clients and occupy themselves with creating materials that are effectively strangemaking artifacts (Jones & Van Patter, 2009). They work from creative briefs that are narrowly framed and then collaborate within their silos to look for solutions. The intent was always to create visually unique artifacts or experiences that would stand out among other representations. In essence, to make the familiar *strange* and thereby garner more attention for the client’s

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<sup>1</sup>. citi brand, <http://www.citigroup.com/citi/>

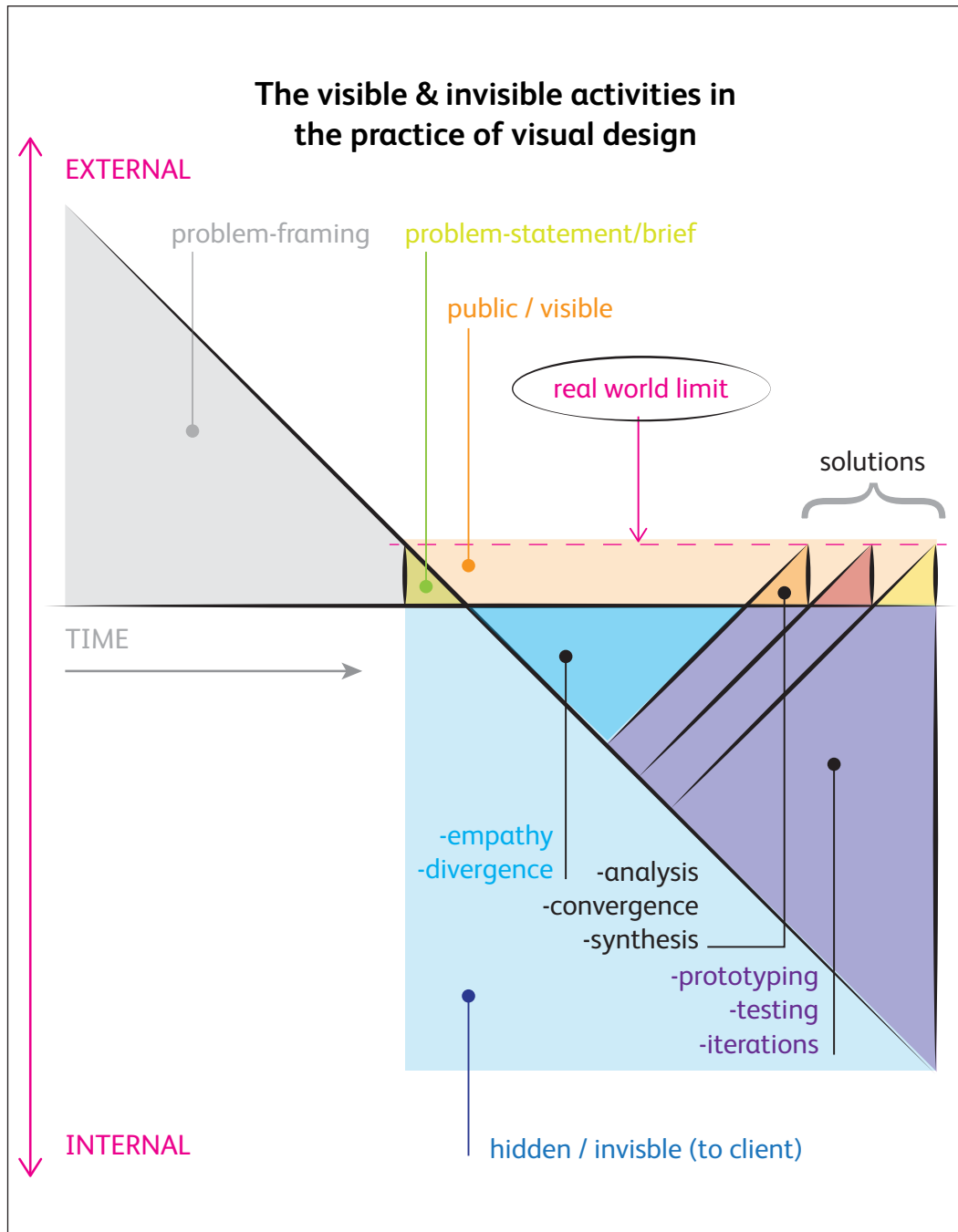


Fig. 7: The scope of a problem space may be artificially “narrowed” in order to meet the requirements of time and financial constraints (real-world limit) (Papanek & Fuller 1972). The process of solution finding (below the X-axis) is typically hidden from the problem-owners and may only surface in the form a rationale for the final solutions offered to a client.

product or service. This way of working cannot penetrate the more complex problems that arise out of human interaction amongst many stakeholders without the inclusion of the deeper sensemaking skills that are embedded in the designer's process.

The way designers work is often limited to formalizing solutions as artifacts that meet the demand of the client, as outlined in the creative brief. The problem and solution space have been set. Proposed solutions that do not address the brief directly are considered "off-strategy" regardless of the "quality" of the strategy. The important challenge for designers is to be able to "shift clients from a problem-solving approach to one that allows for the negotiation of new frames [through] abstractions" (Paton & Dorst 2007). These abstractions employ the use of "metaphor and analogy contextual engagement and conjecture". There are however hard limits set by the reality of time-lines and financial constraints (Figure 7). Ideally "an accepted brief that is understood and agreed upon, should be one in which the designer's and client's frame have come to overlap or align to a certain extent" (Paton & Dorst 2007). They also suggest in the same paper, that "successful communication of new frames depends on co-creation of a language through the hermeneutic process of gaining understanding." It is at this point that we need to consider if the use of visualization techniques are in fact the most effective way to communicate about the disparate frames the key stakeholders have adopted .



*Fig. 8: The visual continuum from strangemaking as art objects to the sensemaking power of scientific diagrams. (e.g. Pollock's "action painting" as self-expression to Feynman diagrams that visually describes the behavior of sub-atomic particles.)*

## The Artist as Strangemaker

Further discussion of the plastic arts and the artist's process is necessary since we are stepping out of purely linguistic forms of ideation and expression. Although visualization and sketching techniques that are being explored are not in any classical sense *art*, the process may indeed be "artful".

Is there a continuum between visual expression as art and visual expression as diagrammatic sensemaking? In the examples shown in Figure 8, one pole is identified by a detail of a Jackson Pollock painting and the other, a Richard Feynman diagram that describes the behavior of sub-atomic particles. The sensemaking utility of the latter is undeniable to a physicist and even affords a glimpse into the complexity of quantum theory to any layperson willing to decode the relatively simply notations he used. In this case, the complexity of the subject matter (content) appears to change places with simplicity of form (Figure 9). Pollock's painting on the other hand exhibits an obvious complexity of form (shapes and colors) although its meaning cannot be generalized. Its success as a painting, is largely dependent on the originality of its form and strangemaking power.

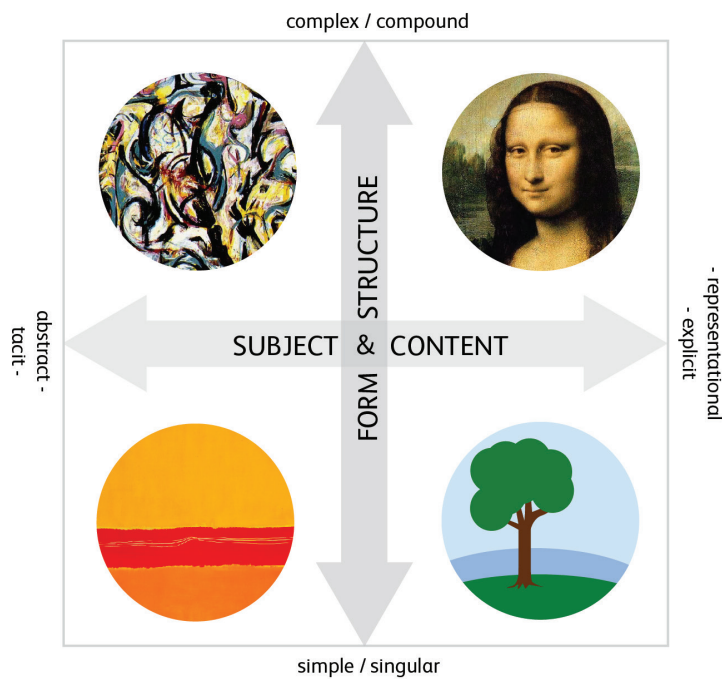


Fig. 9: 2x2 matrix plotting artistic visualization styles against the axes of content and form.

A fine artist does not draw the Figure of a human body by examining the surface features alone, they may learn to draw from the inside out (Perard, 2004). The skeletal and muscle structures define the surface shape. The play of light and shadow on the surface only makes sense when the artist understands what is happening on the inside. She can replicate the light and shadow that defines a surface but without knowing why the shadow bends the way it does, she is just “reporting” on what is seen rather than drawing what is really there. If her subject were to disappear mid-drawing, knowledge of anatomy still enables the artist to make relevant and deep changes to her drawing. This is a useful metaphor for seeing the forces in a complex system or when trying to visualize all the disparate needs of multiple stakeholders.

Art embodies an insight or deep human truth unknowable in an other form (Arnheim, 1972). Art telegraphs its meaning in mysterious ways and never has a predetermined audience. The artist's objective is to surprise her audience with a new perspective on the ordinary. They want their audience to see or feel something new. The sensemaking with a multi-disciplinary team on the other hand may occur within the "room". It requires coming out of one's own head, showing your work and process so that others can understand your point of view more clearly. Making the process visible allows for more effective public interjection and interaction with your thinking.

## **The Visual Pattern as Insight**

*"There is nothing in a caterpillar that tells you it's going to be a butterfly"* (Fuller & Kuromiya, 1992)

By way of illustration I want to twist this quote from R. Buckminster Fuller to "What does the object of your attention want you to see?" Of course we know that certain caterpillars with highly distinctive shapes and colours turn into particular types of butterflies. This is an exercise that demonstrates one way intense seeing might work. Is also equally "empowers" the figure and ground (Figure 10). To fully embrace a complex problem by assigning the actors and objects with having equal relative value, establishing a flat ontology (Bogost, 2012), any object (or actor) could become central or expressive to the problem, thereby unearthing unique connections which may lead to new insights.

### The Caterpillar Effect: Pattern finding exercise

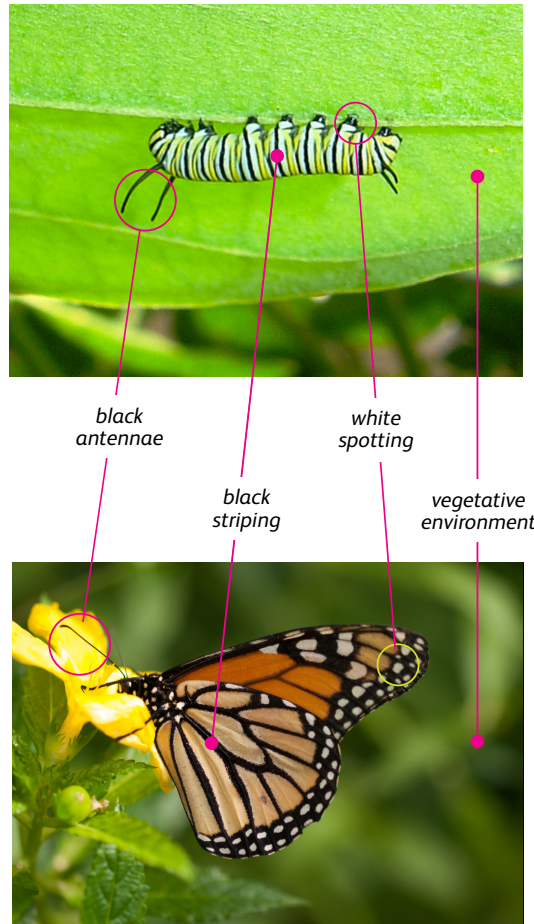


Fig. 10: Photos: Larva by "ddavid", Monarch Butterfly by William Warby, creative commons

Isobars that look regular (Figure 11) would not alert a meteorologist to make mention of it during a weather broadcast to the public. On the other hand, the isobar graph (Figure 12) does indicate an anomaly worthy of a closer look. What appears to be a dent in a series of concentric ellipses, to a meteorologist at least, is indicative of a high-wind event (shaded pink). To a topographer this may be a contour map with the lines



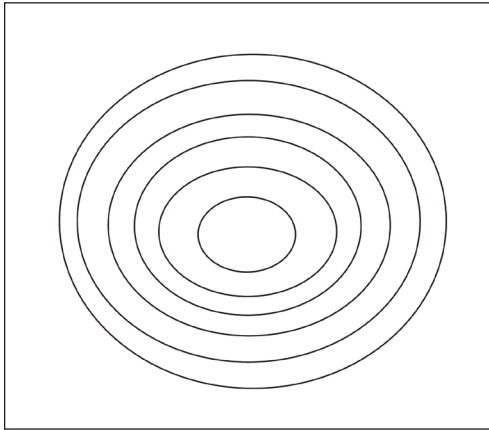


Fig. 11: Isobars

representing points on a terrain of equal distance above sea-level. To her, it is now an indication of a steeper incline. At the very least, a pattern whose usual structure is misaligned or malformed is a productive metaphor that may identify a real anomaly worthy of closer attention. Problem

descriptions or problem statements identify

patterns of phenomena and behaviors that appear to defy the assumed order of things, they disrupt an expected pattern (Arnheim, 1996). A problem feels uncomfortable. Its parts are in disarray, disjointed, unconnected, it is as if an expected pattern is disrupted. A visual designer may seek to “relieve” a congested page of visual notations or a spatial arrangement of data as simply a way of increasing general legibility. She may not be guided by meaning at this stage, but rather by the visual forces present in the space on a page.

What a pattern means depends on the perspective of the viewer. A trained clinician can recognize a mass in a complex MRI scan that would escape notice

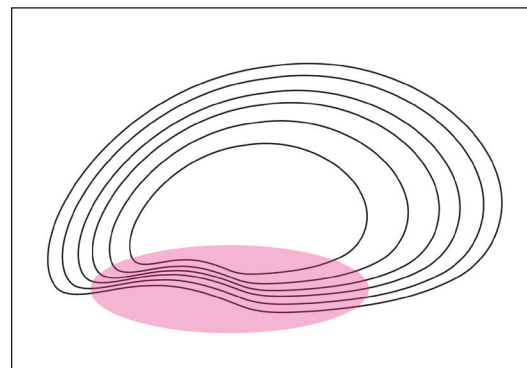


Fig. 12: Isobars indicating a high wind event

by anyone else. This may appear to be trivial on the surface but multiple perspectives guiding the contemplation of the same “pattern” will expose different bits of information to each individual. When experts from disparate domains intersect their thinking with

that of others, new insights may be generated. In that sense, bringing a variety visual structures to data and information (apart from computer aided visualizations) is a very productive way to identify a new gap for discovery. A stakeholder or actor in a system first brings meaning and value from other experiences (their own world view) to the objectively shared “observation” thereby making it a brand new observation.

# RESEARCH DESIGN

## Methods

The following section describes the methods used to analyze the final iteration of the Alzheimer Society of Ontario’s research work and to inform the new iterations developed through sensemaking-strangemaking visual exercises and techniques.

### **1. Analysis of group content.**

In 2013 ASO and their partners conducted a series of workshops. The data captured and visualized in these sessions provided a very rich source of material that embodies the insights, perspectives, sensibilities and experiences from 4 different stakeholder groups: Persons with Dementia, Early Care Partners, Late Care Partners and Health/Social Care Providers. The visual artifacts that they produced were examined and analyzed with the application of Klein’s (2006) sensemaking theory (Figure 13), which asserts that data is defined by a cognitive frame and that the frame itself shapes the data (Klein, Moon & Hoffman 2006). This abductive process moves the data and the way we think about it into new framing structures and metaphors that enable better sensemaking. A new frame

refocuses attention on our data sets which may in turn suggest new areas for further research or even surface a new insight (Johansson 2002).

## 2. Semi-structured interviews.

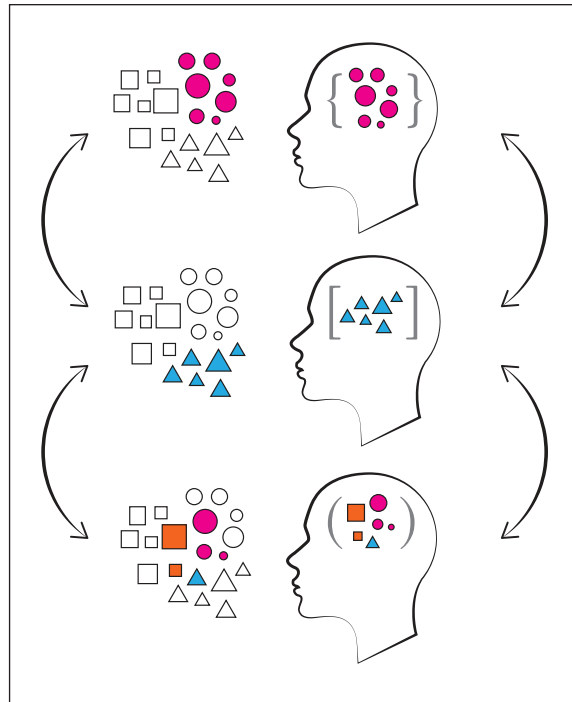
These interviews were designed to uncover the drivers that motivate and guide participants during collaborative work sessions with their colleagues and more specifically with their contributions in the Dementia mapping workshops. I also studied the methods currently employed

when collaborating with other team members, to determine if there was a preference for the use of prose or “visual storytelling” amongst the participants.

## 3. Analysis of participant’s response to sketches versus computer rendered

**visualizations.** This portion of the session was designed to shed light on this inquiry:

Is there a correlation between an organic thought process expressed in “half-sentences and hunches” and visualizations that are roughly sketched with final, more complete “idea presentations” or refined computer generated visual artifacts? Participants were also encouraged to comment on the effectiveness of the latest iteration the Dementia Journey Maps (Subway with roadway “vignettes”).



*Fig. 13 Sensemaking as a continuous cognitive process that includes fitting-data-to-frame and developing frames-to-fit-data (Klein, Moon and Hoffman 2006)*

**4. Data analysis** Data gathered through the interview and artifact critiques were codified and examined for thematic similarities, anomalies and dominance. Analysis and reflection on the results were captured in a series rapid sketches (Figures 18-22 ) which informed new design structures and metaphors.

**5. Reflective design of integrated (idealized) Dementia journey map.**

Analysis and reflection on an idealized dementia journey map yielded new iterations of the journey which focused on potential areas for design and care interventions as well as a “plausible” pathways visualization for a PwD.

## **Participant Profile**

A total of 6 participants were recruited from ASO. The research drew from a sample of 5 in-person interviews and critique sessions as well as 1 telephone interview that included shared visual artifacts. Of the 6 participants, 3 directly participated in the original research workshops conducted by ASO and partners in developing the Dementia Journey Maps, although all were familiar with the projects and the visual outcomes. The participant’s roles within the ASO cuts across the entire strata of organizational responsibilities, involving marketing communication and management positions, policy development, program direction and volunteer recruitment leadership.

The interviews were based on a set of pro forma questions (Appendix B) that were edited and modified from one research session to the next to streamline the discussions and make more effective use the allotted time. Immediately following the interview portion of the

sessions a brief A/B comparison was conducted with visual artifacts that were, a) computer generated – neatly rendered, and b) hand sketched – loosely rendered (see Appendix C).

## **Case Study: Mapping the Dementia Journey**

After examining several organizations and their research objectives, the Alzheimer Society of Ontario (ASO) together with the Centre for Education and Research on Aging & Health, Lakehead University, and the University of Waterloo presented an ideal opportunity to converge my research direction with their visualization work on the Dementia Journey.

Their research mandate was to create a visual model for the progression of Dementia from early onset diagnosis to terminal morbidity. With a plain language approach to communication and the use of commonplace visual metaphors they were able to produce rich visualizations from the perspectives of several different stakeholder groups. The aim of their project was to create artifacts that can be shared with multiple stakeholder groups to aid in the development of service design, guide program evaluation and support awareness campaigns. The outcome of their research sessions, as sensemaking visual aids in the form of maps - roadway and subway - became the starting point for my analysis.

Their focus group consisted of the following:

- *14 people living with dementia,*
- *21 early care partners*
- *3 later care partners*
- *14 health and social care providers participated in the focus groups.*

These groups were encouraged to generate “maps” that would trigger key experiences,



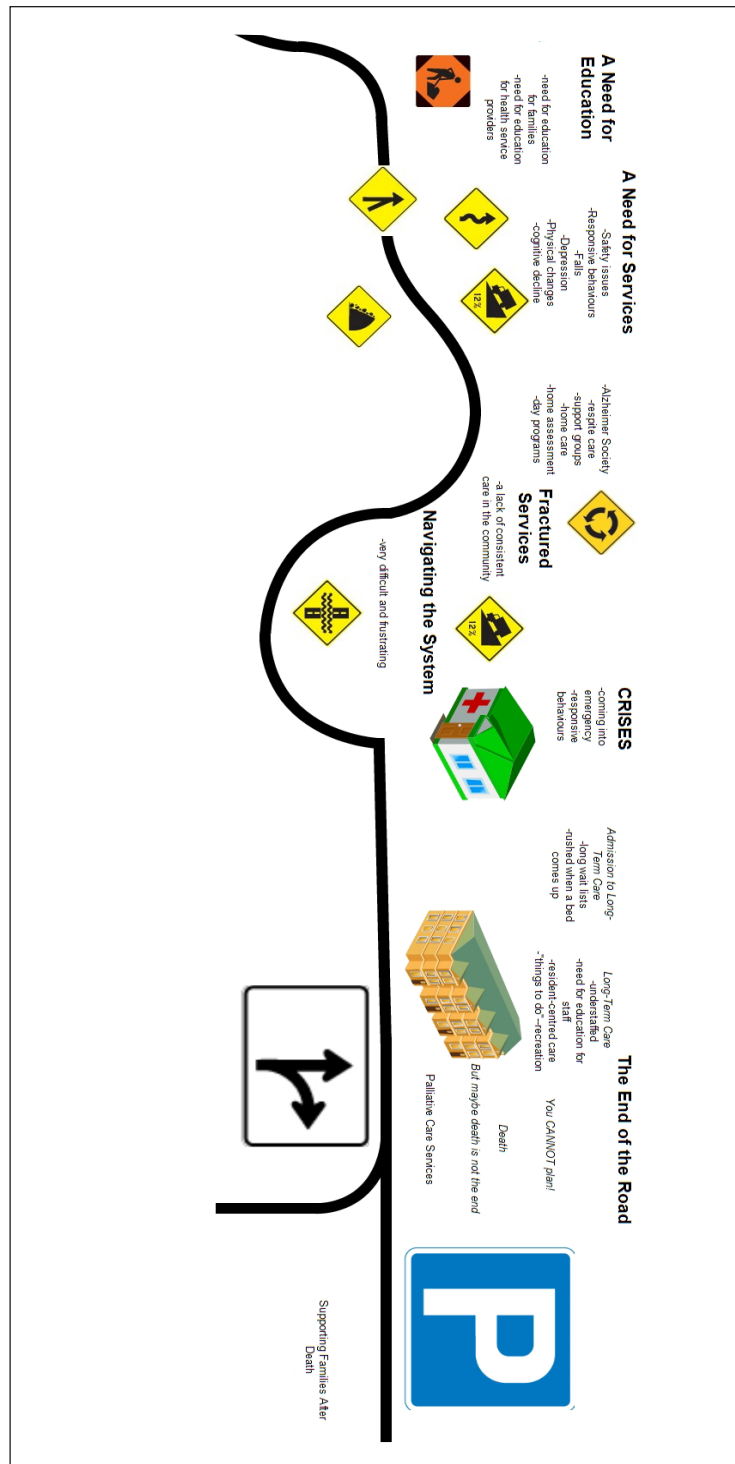


Fig. 14b. Stakeholder perspective: Heath Service Provider, part b.

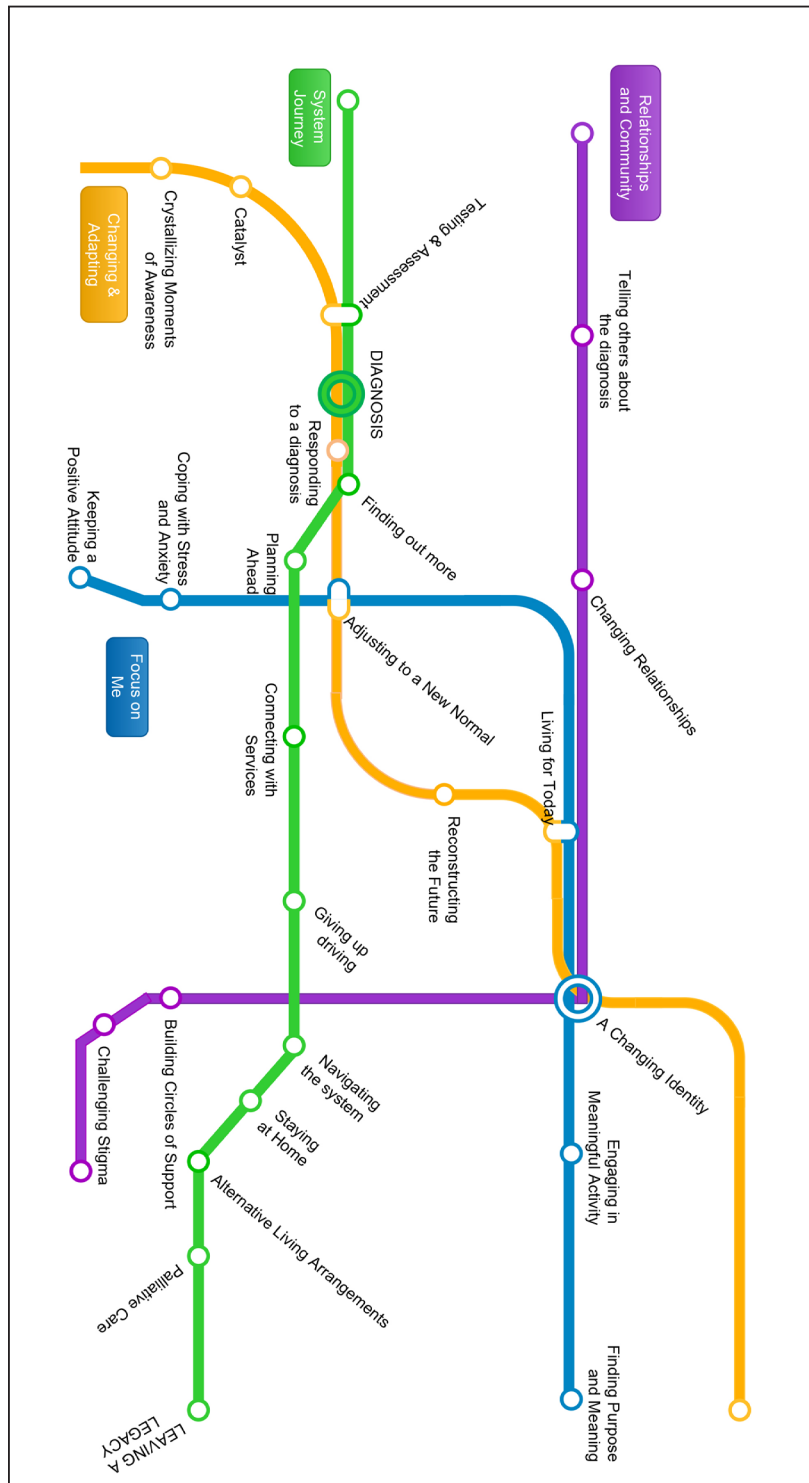


Fig. 15: The current iteration of the *The Dementia Journey* re-framed as a subway map system designed primarily from a *Persons-with-Dementia* perspective.



sensitivities and observation around the progression of the disease. With the help of metaphors in the form of traffic signage and roadways, the participants were able to verbalize and demonstrate momentous events in the dementia journey. The first outcomes were a series of roadway maps that described the journey from the perspective of the four central stakeholder groups: *Persons with Dementia*, *Early Care Partners*, *Late Care Partners* and *Health and Social care providers*.

Figures 14a-14b represents the first series of visualizations for the “Dementia Journey” as roadway maps from the various perspectives of the stakeholder groups (see Appendix D for all maps from each group). These visualizations were then reviewed again at a later date by some of the original participants and others. Further reflection on the data, findings and the roadway maps lead to the next interpretation of the dementia journey as a subway map system (Figure 15). Some of the original roadway elements were also retained and served as graphic icons and mnemonic devices to highlight experiences along the journey and are revealed at the “surface” level when users (general audience) drill into the specific milestones for more information. Figure 15 captures the entire research cycle undertaken by the ASO to final form as a subway map.

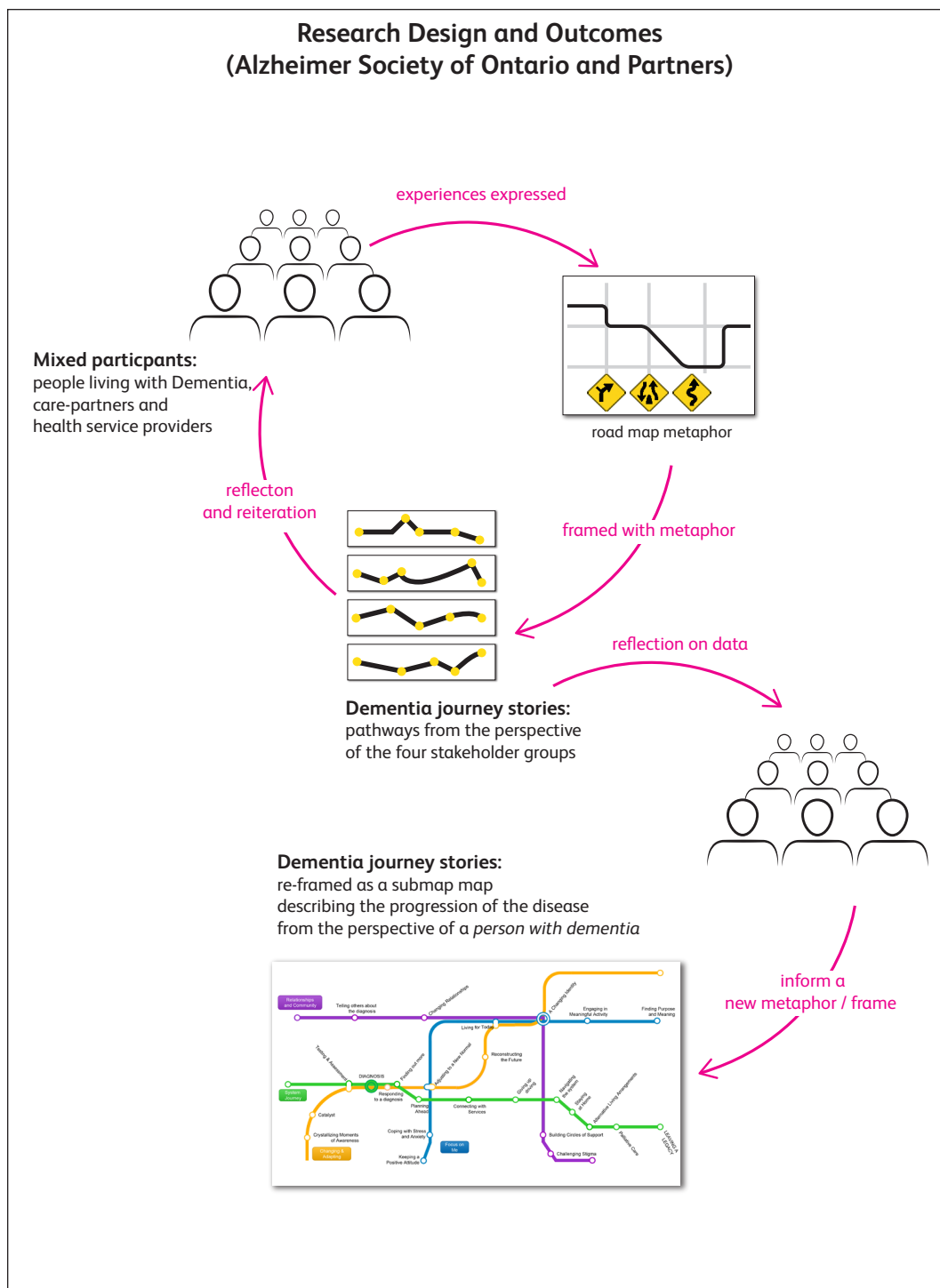


Fig. 15: ASO and partner's research process behind Mapping the Dementia Journey

# ANALYSIS

## Analysis of Prior Representations

*(Maps created by the Alzheimer Society of Ontario and Partners)*

Analysis of the visualizations produced by ASO and partners was assisted by exploring their final iteration of the Dementia journey maps from the perspective of their key stakeholder group. This journey is captured in the narrative below:

“Focus on Me” (i.e. Person with Dementia - PwD)

*Keeping a positive attitude **(after diagnosis)** coping with stress and anxiety **(by learning to)** adjust to a new normal **(and learning to)** live life for today **(by coping with)** a changing identity, **(learning to)** engage in meaningful activity **(and to)** find purpose and meaning **(in my life despite my affliction)***

## Critique of Maps

If one assumes the role of PwD in this example, and travels along the subway route past various destinations as identified on the map, the “motive” force that underpins the time-line between destinations needs to be indicated by the use of verbs and descriptive text (highlighted in bold with parentheses, above). The subway system is essentially a passive metaphor and passengers can not exert their will to change course or revise their actions until they reach a predetermined destination.

Further analysis and reflection on these visualizations was approached primarily from the perspective of a visual designer with the understanding that formal visual design practices

are outside the technical abilities of the research team and participants who constructed it. However, any key insights and research findings to complex problems that are visualized or expressed by various stakeholders transcends the needs of any formal visual design process in the early stages of sensemaking. The “sketch” or rough visualizations is always sufficient to record and frame the data.

The final iteration of the subway map retains some of the original elements of the prior roadmap visualizations, but do not appear to integrate them in any way that would suggest deeper meaning. This is a point at which more data could be gathered to support the current metaphor structure. For example, this new frame suggests that there may be an “undercurrent” to the journey that bears further investigation. The subterranean pathway surfaces at various points in the journey which could indicate that these events possess an innate “noteworthiness” and perhaps identify potential areas for design intervention.

The subway map structure re-frames the original data, but appears to stop short of fully utilizing the features of this metaphor. To align the data more closely with this frame each “station/destination” should express the same level of importance (or dynamic relationship) whenever they appear. The stations identified below give the impression that they may be *special* areas that indicate the confluence of needs between various stakeholders.

- *Diagnosis*
- *Living for today*
- *Adjusting to a new normal*
- *A Changing identity*

Upon deeper analysis it is not clear how this interaction is intended to be perceived.

It is also not evident if subway “lines” (identified below) have the same qualitative values since they are displayed with equal graphic importance (apart from color coding):

- *Relationships & community*
- *System journey*
- *Changing & adapting*
- *Focus on me*

“*Changing & adapting*”, “*relationships & community*” and “*focus on me*” are essentially person-with-dementia centered perspectives, but they are represented as a sprawling multiple network without meaningful connections or “transfer” points. Each trajectory or pathway also appears to have its own end-point destination but is not consistently labelled.<sup>4</sup> A “map of trajectories” as depicted also begs for the identification of ultimate or final destinations.

In review with participants this latest iteration was considered to be a distinct improvement from the initial visualization as road ways and traffic signs. At first glance the subway map held a lot of promise in affording users concrete and actionable points of focus. Deeper contemplation on the map structure and overall “story” suggests that either more work needs to be done to fully engage the features of this metaphor to mine them for new perspectives or revise entirely and adopt a totally new framing device.

As a structure, the map organizes milestones along the journey of a person with dementia and has meaning to the authors. The fact that it resembles a real subway map system will suggest to any new viewers however that the authors intended to infuse

these milestones and pathways with real meaning that can be “borrowed” from the subway metaphor, such as transfer points, stations and destinations.

If the metaphor is to guide the comprehension and work as a sensemaking tool for those outside of the research it would need to more carefully align dynamic relationships and events of the dementia journey. With such an overt visual structure, it would need to behave according to its origin. In this case, a subway system map reflects the optimized travel patterns of commuters heading to different destinations. The progression of this disease however is unpredictable and the “destinations” unknown.

Traffic signage by definition, is designed to be unambiguous and linear. The icons are typically very bold and simple to limit misinterpretation and ensure legibility. Assigning new meaning to existing traffic signage through labeling may work on several occasions within this context, but rarely for all. “Staying at Home” as a milestone on a journey is not successfully communicated with a “rock-fall warning sign”. Traffic signs work better and are read more clearly when they demonstrate relevant concepts with the iconography on the “sign” itself.

Subsequent iterations of the Dementia Journey Map were informed by the participants during interviews and visual artefact critique. The complicated nature of the subway map was considered to be an appropriate representation of the complexity of the *Dementia Journey* in relation to stakeholder needs.

The network of pathways does not actually adhere to any formal spatial considerations in terms of directional paths. “Going down” or abrupt turns were equated with negative disruption and failing health. Points on the pathway that share their position with other

“stations” require readers to consider them as actual “transfer” points. The sensemaking effectiveness of this map is also hindered by the appearance that stakeholder relationships are indicated with other subway lines, suggesting that support for the PwD could only be offered when they are on the same pathway or that the PwD could not actually be on more than one line at a time.

## Sensemaking Sketching and Reflection

The primary visual analysis of the Dementia Journey Map represents the content of the final distillation of data from the original participants in ASO focus groups. The re-imagined design was informed in part, by my independent research plan. As noted previously the “natural” complexity of a subway map system was not considered to be problematic and was generally well received. Although it should also be noted that no participant was able to actually follow the narrative suggested by the Subway Map.

I reflected on the current work with rapid sketching as way to visualize a personal understanding of the dementia journey. I also employed visual design principles from Wong (1972) as a means to assist in re-framing the given data. This analysis enabled me to surface my own tacit knowledge of design and lay bare some of the forces that guide my visual design process. The principles are partly derived from his study of what formal properties constitute an effective visual design that he defines as being *aesthetically pleasing and entirely functional*.

<b>DESIGN PRINCIPLE (WONG 1972)</b>	<b>DESIGNERLY INTERPRETATION</b>	<b>VISUAL DEPICTION</b>
Form and structure	<p>What is the form of the system?</p> <p>What forces govern or influence the direction of the vectors?</p> <ul style="list-style-type: none"> <li>• boundaries and edges</li> </ul>	
Repetition - cadence	<p>What is the rhythm of the system?</p> <p>What events are repetitive ?</p> <ul style="list-style-type: none"> <li>• crossing paths</li> </ul>	
Similarity	<p>What actors behavior or events appear similar?</p> <p>In what way do they express common needs and objectives?</p> <ul style="list-style-type: none"> <li>• similar yet from opposite perspectives</li> </ul>	
Gradations / color shifts	<p>What is the rate of change or time scale of events and their triggering points?</p>	
Anomalies and perturbations	<p>What does not seem right, breaks the pattern or feels incongruous to the whole?</p> <p>Is there a counter-intuitive structure or events present? e.g going backwards in time</p>	
Contrast	<p>What elements of the system are in greatest conflict?</p> <ul style="list-style-type: none"> <li>• encroach</li> <li>• supercede</li> </ul>	

Table 1:Design Principles for Visual Sensemaking



The compilation of Wong's 2-dimensional design principles as shown in Table 1 are considered only in as far as they surface suitable structural devices to help illustrate the system. This is tantamount to making explicit what visual designers do instinctively. Designers may have been exposed to these methods as young learners but would have embedded this knowledge over many years of practice (Cross 2001). Wong originally developed this set of design rules through his heuristic evaluation of well-designed and aesthetically pleasing visual artifacts.

I reflected on these visual design principles with only the data captured by the ASO and have forced them into service as a type of scaffold for "designerly" sensemaking to inform the new visualizations.



*Fig. 17 The Ganges River delta, Space Shuttle Columbia 1981, creative commons*

During interviews and discussions on the current ASO subway map, participants offered various new metaphors to frame the journey, most notably, tree root and river delta systems (Figure 17). The journey was re-imagined as something that was more organic and one that resembles a natural flow from one event and experience (milestone) to another. The river system metaphor was considered to be more representative of a life-journey (healthy or otherwise ) and could provide productive visual devices to underpin the life-progress of a person afflicted with dementia. The key messages conveyed by this new metaphor are: a.) convergence of energy (from others in one's life and through life experiences in general and b.) the inexorable passage of time. This might be a more appropriate structure to help express the indeterminate nature of a PwD journey than a mechanistic subway map with its rigid pathways and distinct destination points.

## Proposed Representations

The final 3 computer-assisted visualizations are derived from quick sketches as sensemaking-strangemaking exercises that are captured in Figures 18 -22.

### 1) Persons with Dementia Journey:

#### Idealized pathway of disease progression

(Figure 25) All stakeholder groups align their support and interventions with the needs of the PwD.

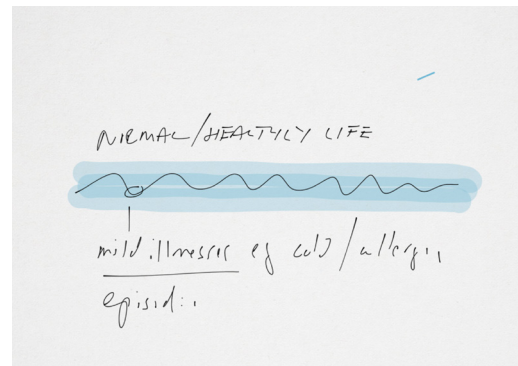


Fig.18 Exploring the natural ebb and flow of a "healthy life".

### 2). Persons with Dementia Journey:

#### Identifying potential areas for design and/or care intervention.

(Figure 26) A meta-analysis of Version 1 was developed with particular attention paid to time-ordering of milestone events

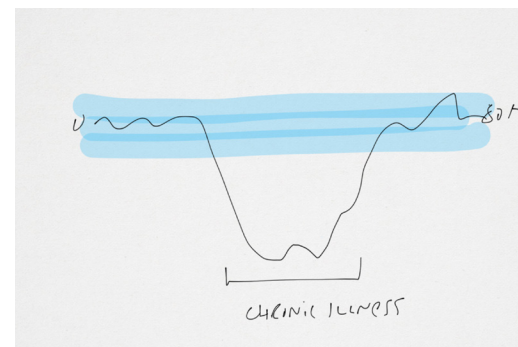


Fig.19 "falling" out of a healthy life path.

### 3). Persons with Dementia Journey:

#### Plausible pathways of disease progression.

This artifact was developed as a visual expression of possible pathways of progression based on the data from ASO and rapid sketching.

The focus of the story in Version 1, (Figure 25) on *Persons with Dementia*,

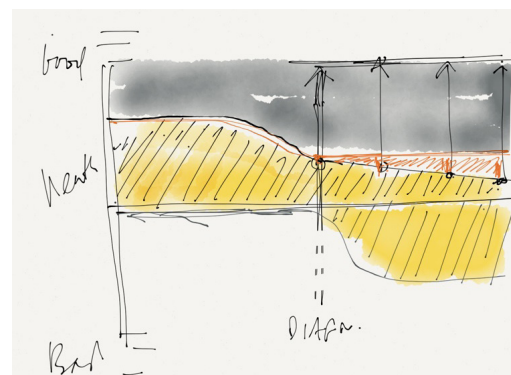


Fig.20 Visualizing the decline of health at the point of diagnosis, the need for regular monitoring of progress and "filling the gaps".

are represented as the main structure which has visual dominance (Orange band, Figure 23). The care partners and healthcare system “sandwich” the central actor’s progress on the journey. The proximity of the “flow” of this stakeholder group suggests constant contact and support.

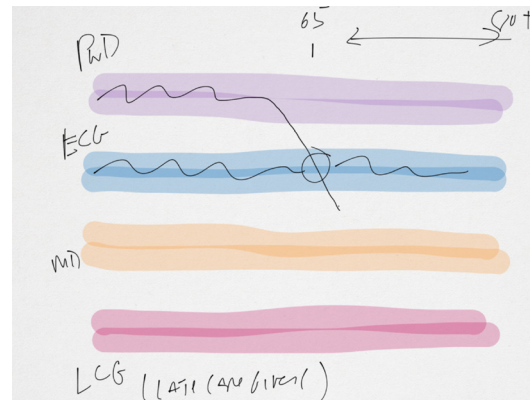


Fig.21 Stakeholder pathways as separate events in time while the PwD goes “off course”

Care partners may often echo the journey of the those afflicted with dementia if they are family members. The path of anyone’s day-to-day life is never wholly linear nor do events occur in isolation. A memory lapse for instance, impacts both the *Person with Dementia* and their primary care partner, they both share frustrations.

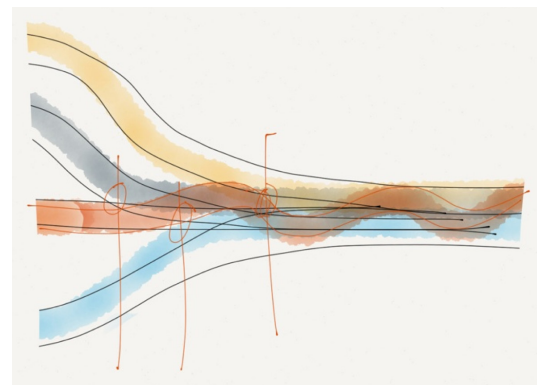


Fig.22 Exploring the pathways of all stakeholder groups coming to the aid of PwD

When a designer applies the discipline of a visual design aesthetic to the information that has been gathered by all the stakeholders, various connections are constructed that may not have been evident to anyone else if this story was

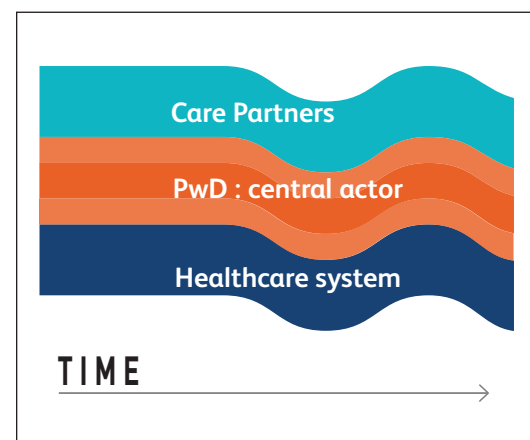


Fig.23 Detail from re-visualized and idealized dementia journey map

told with just a multi-page report. The “designed” space and its content make it easier to digest and to remember. It can be designed to provoke attention. If it is visually appealing, it also welcomes and encourages deeper contemplation.

At the heart of visual design is a skeleton upon which the data hangs, viz. the grid. It is the structure through which visual elements are arranged and distributed over a two-dimensional plane. These invisible guide lines enable a type of visual sensemaking from a purely aesthetic perspective and meaning when the grid system embodies qualitative or quantitative forces embedded in axes. In the case of the *Dementia Journey Maps* these forces are *space and time*. Even a simple 2x2 matrix for “chunking” relational elements needs the grid structure in order to work. Like the plot line of a story, the grid guides the pace and cadence of elements, it helps communicate the intent of the design by giving order to the space.

The central theme of the Dementia Journey is the time line. It drives the placement of the key activities, milestones, emotions and observations of the primary stakeholders. A more strict adherence to the timing of events ( or the perception of when events may occur) was a major design force and feature of this map. *Persons with Dementia* (PwD) as the central actors in the journey are not only placed in the center of the stakeholder array, they visually “enter” the adjacent realms ( i.e. Healthcare system and Community). The “spiking vertical vectors” (Figure 24) infiltrate other stakeholder domains because no action or event around *Persons with Dementia*’s journey will ever occur in complete isolation. These vertical spikes help connect and identify events and actions that may actually occur at the same time.

By employing more rigid visual design principles as noted previously the map takes on a structured and more simplified form. A visual designer would organize this space for legibility and clarity first while adhering to the features present in the framing metaphor. Once this is complete, current and new participants are invited into the research process to iterate further on the map.

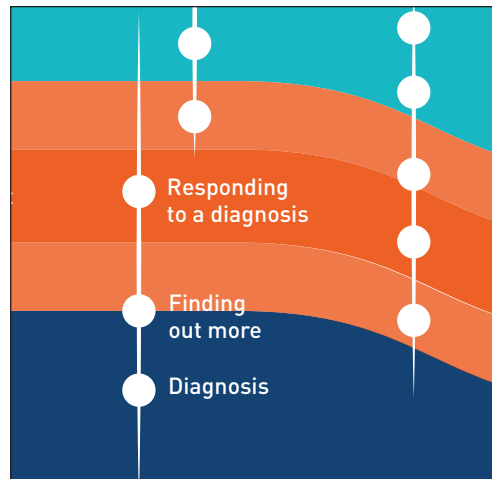


Fig. 24 Detail from the idealized dementia journey map - “spiking” vectors

This version is informed by reflection and with a sensitivity to the actual “forces” on the page. The original path, for example was designed to undulate in order to mimic not only the precarious health condition of *Persons with Dementia* but also to reflect the natural ebb and flow of a “good day and a bad day” (Hutchings, et al 2010). This could also be viewed as normalizing the Dementia condition since “good and bad days” are a universal experience for all individuals regardless of their state of health. The primary shift in this re-framing exercise captures the position of events that now appear to occur simultaneously. Intuitively it seems more natural to consider, for example, that “*being diagnosed*” with Dementia is concurrent with the person’s need to find out more about their condition. Just as “*telling others about the diagnosis*” means that you must “*challenge stigma*” to initiate that conversation in the first place. The occurrence of events in this iteration adheres to tighter and more realistic time-lines than the subway metaphor. With the subway map the passage of time was only implied. The inevitability of time passing is more apparent

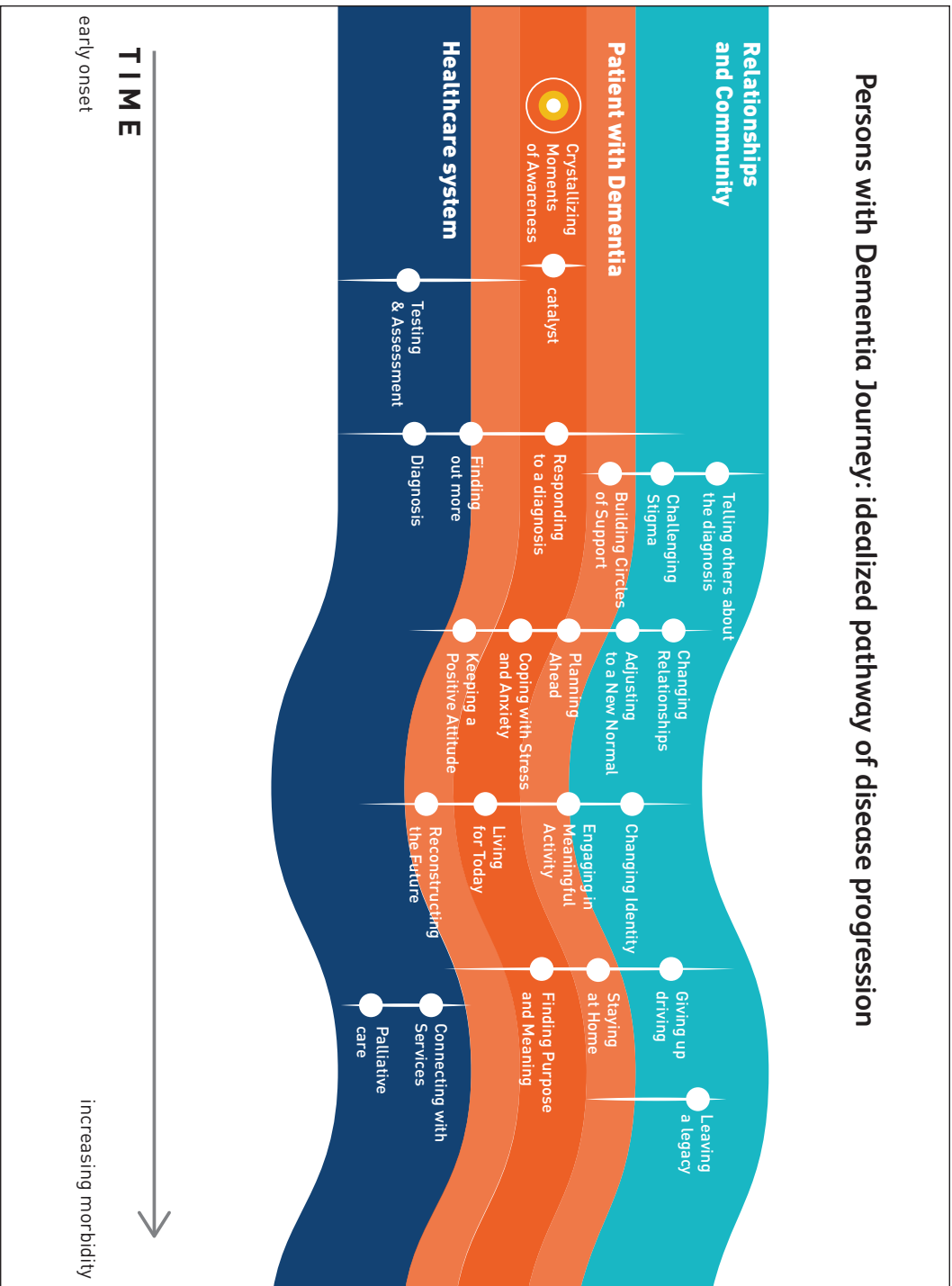


Fig. 25: Re-imagined and Idealized Dementia Journey Map

in this proposal with the implication that some of these events along the journey demand immediate attention and a more proactive mind-set.

Version 2 (Figure 26) was developed through further reflection, as a type of meta-analysis, of the artifact as a “surface” or object and from a wholly visual design perspective yielding particular points of interests. By keeping events within a tight grid structure, points of commonality were revealed. Key words such as *Future, Purpose, Meaning, Planning and Identity* start to describe where more investigation could be centered and may even indicate intervention points for future service design innovations. The strict time line also brought focus to the idea that individuals “travel” backward in time with memories, but also travel forward in time with imagination and the hope of a different (positive) future. As a visual sensemaking tool derived from an idealized dementia journey pathway, stakeholders and designers can share a common vision for ways to introduce new ideas around care and service design to create a more positive outcome for persons with dementia

The design for the final visualization, “plausible pathways” (Figure 27), was based on “activating existing knowledge” (Sevaldson, 2014), since there is no evidence gathered in the ASO session (as captured in the maps) to verify any deeply negative events. From medical cases and experience we can assume that people with dementia, with its highly stigmatized and fearful reputation will remain untreated until the symptoms demand attention. Some individuals will literally fall through the cracks and out of sight, visualized as disappearing behind or beneath the healthcare and care partner superstructures.

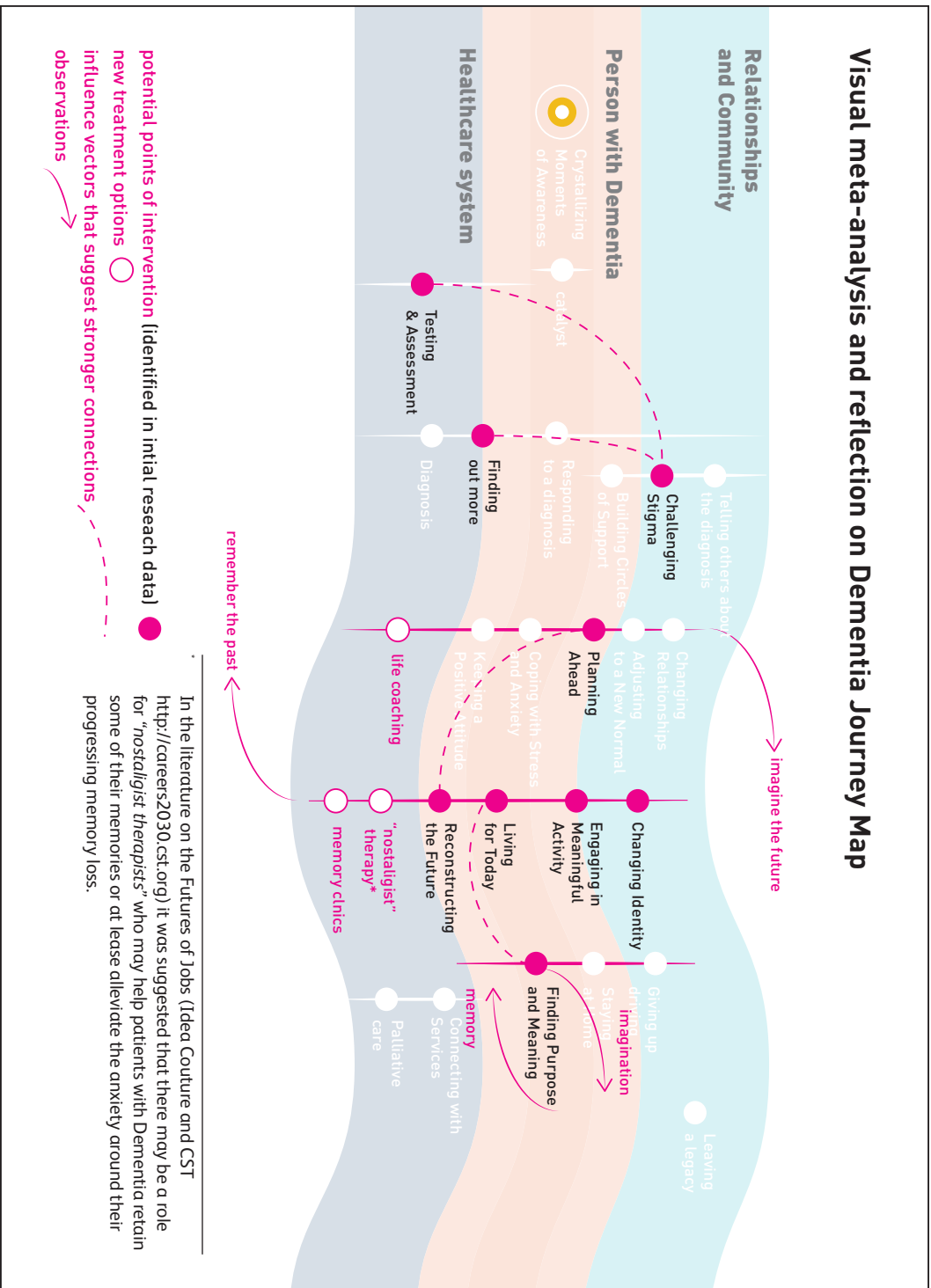


Fig. 26: Visual review and meta-analysis of the idealized dementia journey map



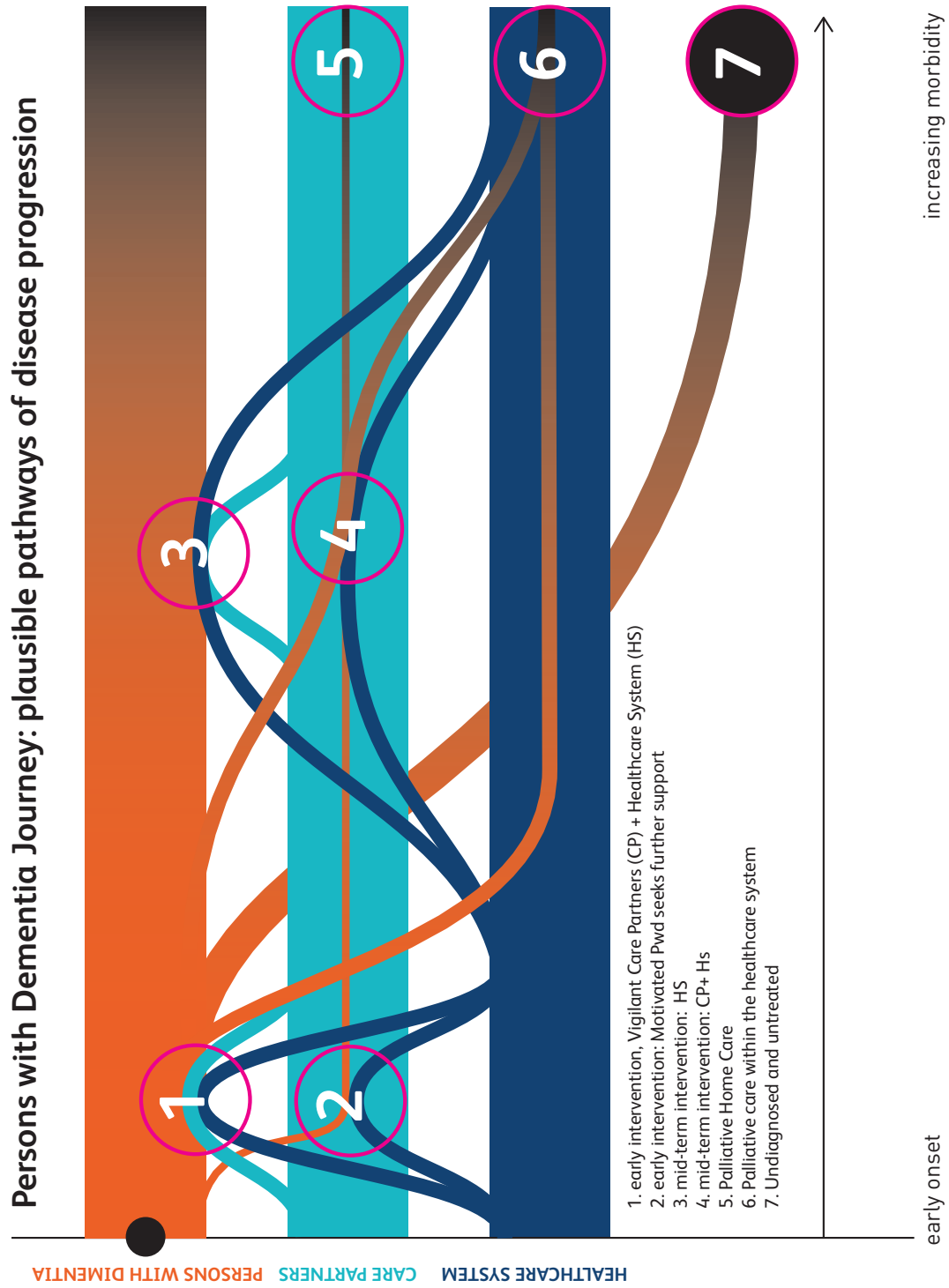


Fig. 27: Developing plausible pathways for the disease's progression

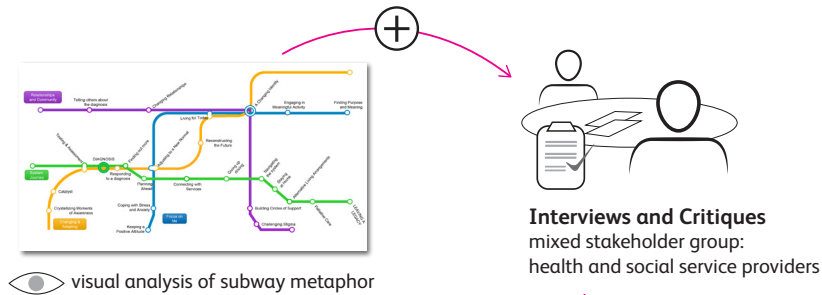
Potential care partners as “rivulets” split off to intercede, in some instances to actually “rise” to the challenge in support of a PwD or help them ease into some sort of support structure offered by care partners or the healthcare system. Likewise it is not unthinkable that someone who is knowledgeable and proactive about their own health may actively seek counsel and support. More importantly this iteration also demonstrates how the current state of care and support for PwD from care partners and the healthcare system is seriously misaligned. The enormous financial burden on the system as well as on the care partners threatens the quality of life for caregivers and PwD alike.

The final iteration from the ASO as a crisscrossing network of subway tracks has the unintended resemblance of tangled neurons, a primary marker of Alzheimers Disease. If the map intentionally looks complicated because the disease is complicated we are left with very little to go on. It is not particularly easy to read nor does it even manage to satisfy the metaphoric usage of a subway system in any effective way. There are no real stations, no way to get “off this train” and the final destination remains unstated as if it is just too difficult to contemplate. The intention for ASO was to reveal the complexity of this disease against the backdrop of the lives of care partners and the health care system. The hope was that this revelation of complexity would indicate where positive interventions could come into focus. At the very least they could show others, (a general audience) what the key milestones look like or feel like for a PwD, to make it clear, to give them a better understanding of the disease and its effect on a community of care partners and health care workers.

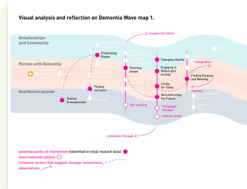
The persons with dementia journey is just a story that follows a plot line populated with events, experiences, perspectives and sensibilities from the participants in the ASO research plan. What the story looks like is open to interpretation. A typical arc to the story may be one that begins to slope in a downward fashion to represent “degradation” as a way to demonstrate the slow decline of cognitive and physical function. This is not at all suggested by the aggregated information that was originally plotted in the initial roadmap “sessions” and final subway maps. This information is essentially neutral: “Responding to a diagnosis” or even somewhat more positive: “Finding Purpose and meaning”. It is how these points come together across the various strata of care partners with the focus on PwD that underscores the design of the re-visualization: “Persons with Dementia Journey: idealized pathway of disease progression”

This is an “idealized” structure in as far as it is organized according to a horizontal time-line along its x-axis. Vertically traversing a mantle of care partners and healthcare stakeholders in both directions, above and below. It is strongly suggestive of where stakeholder groups may naturally coalesce to assist the PwD. It is all about the PwD and their journey after all. It is never a pleasant journey but it can be made to be more comfortable and humane. This image with its thick paths that flow in concert with the PwD’s pathway represents constant contact and support. Although it would not be a surprise to believe that some PwD actually do get full and constant support from care partners, this image represents an aspirational version the PwD journey. Taken on its own however, it could confuse the causal observer that all is well with the care programs in regard to this disease.

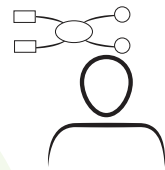
## Research Design and Outcomes



### meta-analysis

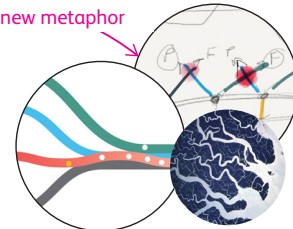


**Visual Design Grid**  
reframes data capture:  
uncovering potential areas  
for innovation



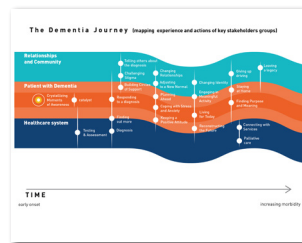
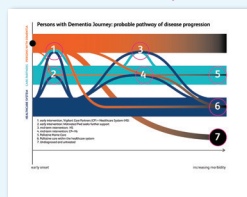
codification  
of data and analysis

reframe and inform  
new metaphor



sensemake with  
the surface \*

iterate



**Idealized Dementia Journey**

iterate

\* reflecting on the visual structures, elements and grid system from a "designerly" aesthetic perspective; looking for any new relationship that may be suggested by shape and proximity

Fig. 28: The full cycle of research from the analysis of ASO's research outcomes to the development of new visualizations.

Figure 28 illustrate the entire cycle of research that was conducted. It begins with an analysis of ASO's research outcomes (subway map iteration) and proceeds to the development of 3 new visualizations informed by participant interviews, sensemaking-strangemaking sketching and the designerly ways of knowing (Wong 1972) (Cross 2001).

## Analysis and Synthesis in the Designer's Process

After all of the problem-finding and framing, the data collection and parsing, the iterations

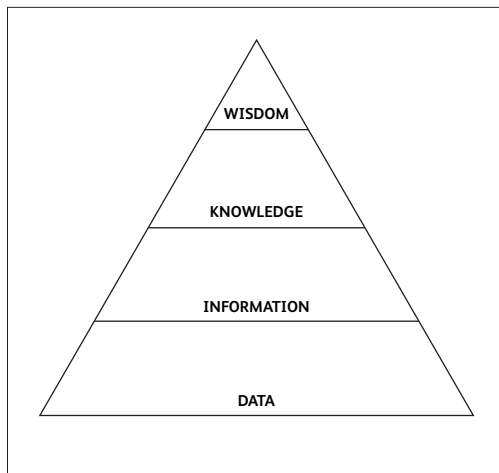


Fig. 29: Ackoff's Pyramid

and the incubation an insight may finally surface. But how exactly did we get there? Moving up Ackoff's pyramid (1988) is arduous work (Figure 29). The data we gather in a research process is identified by the frames we adopt through the nature of our study. The data does not just appear in a sea of phenomena, we find it based on our research plan and methods. This is the lens

through which we examine the phenomena of our study to gather relevant data. When we apply what we explicitly know or tacitly believe to interpret our findings we transform our data into information. The frame we use will change as we gather more data. Moving up the DIKW pyramid is not linear or unidirectional. We vacillate between sensemaking levels, testing working hypotheses against the data we have, which in turn guides the collection of more data. "Deep understanding involves being able to move between these levels of abstract knowledge, interpreted information, and concrete data" (Sanders & Stappers, 2012). Dissecting the process seems to destroy any hope of finding any definitive structure

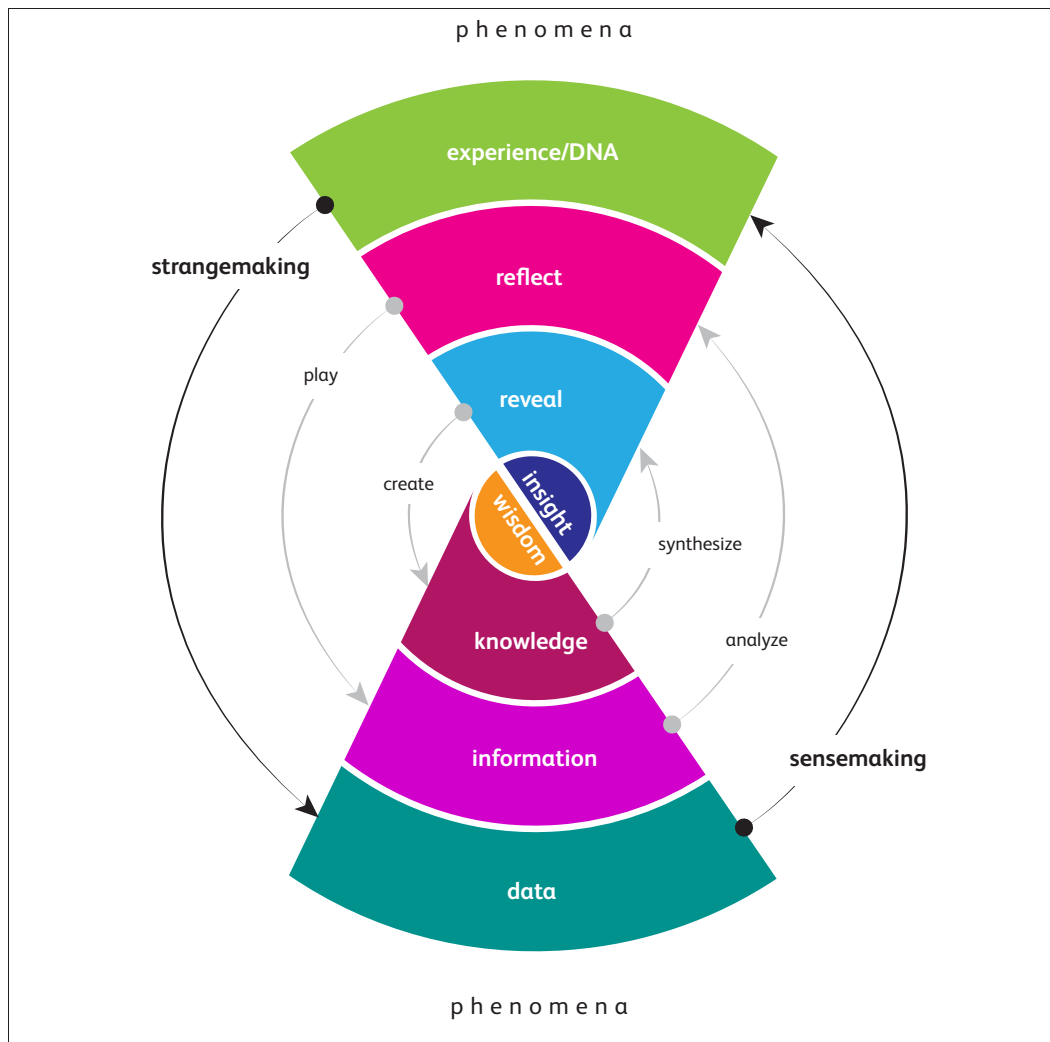


Fig. 30: The strangemaker's process meets Ackoff's DIKW pyramid

or element that defines the actual synthesis when shifting from one stage into the next (see Appendices D, E : thinking sketches). Sometimes an insight comes into view not because we are following a particular critical thinking methodology, but because we are just “doing something”. With visual thinking the “doing” is in the way we physically change the “space” the data-chunks occupy. The sheer physicality of visual design appears to be a significant factor for the elicitation of tacit knowledge during working sessions and would warrant more research.

All critical thinking methods are important because they make us address data in a very structured way. They can not actually lead the team to the insight, the methods restructure only re-frame the data through a sensemaking process. The physical movement of data, the visual design “aesthetic” may inspire new ideas, in this way too. It is not just the work done on the wall, but it is also the energy conveyed by solvers, their physical stance, their passion and the embodiment of an emotion. “Gesturing does not merely reflect thought: Gesture changes thought by introducing action into one’s mental representations. Gesture forces people to think with their hands” (Beilock & Goldin-Meadow 2010). When working with Ackoff’s DIKW pyramid (Figure 30) and analyzing my research data it occurred to me that there may be a “parallel” sequence that visual designers engage in while they work. The “other side” to sensemaking is governed by the tendencies of designers to also include their own-way-of-knowing in this process. They are applying their knowledge of how visual design artifacts begin to develop form, in this way they too are searching for the right answer or a kind of truth. If concepts can be expressed as perceptual images that are the result of artistic or strangemaking activity, then a surface covered in pigment or ink, engages our cognitive faculties as percepts (Arnheim, 1972). The concepts or propositions embodied in sketching (or prototyping) at this stage are meant to remain open to interpretation. Both the artist and scientist are not certain where their open inquiry may lead them. Picasso said that “I begin with an idea and then it becomes something else.” The plastic arts may be only a medium for self-expression, not scientific inquiry. The artist is not solving a problem that is objective to her. She will always surrender to her medium. The medium will tease out of her a proposition, a form, a color sequence, a melody, or an experience. She cannot predict the outcome but only nudge the direction the final form may take.

This is curiously similar to the way we may function as human beings in a complex organization. We can participate in a demographic process and make our wishes known, we may even be able to persuade others to accept our point of view. We also need to “see deeply” into the data we gather in a research process to find meaning in it. We codify, chunk and parse data until we find a pattern that makes sense to us. How the artist perceives her world and creates her art is the same way a scientist conducts an experiment and verifies an hypothesis. A scientist and artist both understand that they live in a world of phenomena that unfold as “network of genera” and not as a sequence of disparate events. The artist expresses her understanding of the natural world through the art she creates. (Arnheim, 1972). The scientist may seek to measure results and quantify evidence, but she is also after qualitative facts. In the end, the cure for Dementia may be in the formulation of a new medication but the effects of the cure are also expressed as a qualitative fact.

## DISCUSSION

All the maps are pictures from complexity and express a point of view on the underlying data that will help some stakeholders to make meaning. Some will work better than others in different situations - because visual interpretation is involved, there will always be a subjective element and therefore room for argument regarding the fit to the universe of data and, of course, to the real world. They map a given set of observations and attempt to make it accessible to any audience. These picture do not offer solutions but act more like a collection of observations designed encourage a kind of “distributed sensemaking” with the understanding that “multiple theories develop about what is happening and what needs to be done, people learn to work interdependently despite couplings loosened



by the pursuit of diverse theories, and inductions may be more clearly associated with effectiveness when they provide equivalent rather than shared meanings” (Weick, 2005).

## Sketching to Think

When we talk about solutions to complex problems in the hard sciences as “elegant” what do we really mean? A mathematical solution is considered elegant when it clearly embodies deep mathematical insight and is presented in as short an expression as possible. Or we call a computer algorithm elegant when it is written in the fewest lines of code for the greatest effect. It is optimal dosage for optimal efficacy. Simplicity coupled with effectiveness equals elegance and beauty. So a good solution is elegant whereas a problem may be complex, messy, intractable or chaotic.

Solutions “look” finished even when they may be wrong. When we need input on the first stage of a solution is a rough outline or generalized sketch enough of a start? Final visual artifacts or visualizations that look more complete or “finished” may feel more like a complete thought, and therefore are more suitable for collaborative input.

“Clarity facilitates access”<sup>4</sup>. And the yet the “big messy picture” is more clearly in a state of flux and as such is not a “complete” thought. It appears however to inhibit interaction. It is akin to not wanting to finish someone else’s statement while they are in the midst of an “utterance”. A half-thought, or to use the vernacular, “half-baked” ideas and utterances may not fare well in certain professional organizations. The freedom to speak must also include the freedom to think out loud and that must include the freedom to

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<sup>4</sup> Verbatim from interviews

say something wrong or even absurd. There is a constant dialog between the author and the words on the page, reworking and rewriting. The same is true for visual design. Ideas are formed both inside of us (cognition) and outside (perception and interaction ) as well as throughout our bodies (intuition and emotion). The interplay between the thinker, the ideas in her head, the discussion in the room, and the constant revision and re-calibration of perspective and nuance is what produces the most effective outcome. We are affected constantly by memory, by immediate experience and by google search. This constant revision and reiteration may not be a public or social process in larger multi-disciplinary groups when clarity is more readily accepted over chaotic content. Clarity and precision may limit ideation, but is in demand especially when conducting digital meetings rather than face-to-face ones, where ideas are more readily *presented* rather than *formed or discovered* in meetings.

## **Creating a Culture of Intellectual Intimacy and Play**

The outcome of a creative visual thinking session, whether it is a result of collaboration or developed individually is typically just a “visualization” or a sketch. Its formal qualities should not interfere with its message. It can represent a concept, a principle or even a feeling. This type of visualization should not be conflated with “Graphic recordings.” A visual recording of an idea differs from visual thinking in a subtle but profound manner. A thought process may be externalized in such a way that the actor is unaware of the final outcome. This is not to say that you can not “see” a thought in your mind’s eye, then commit it to a surface. It is a type of improvisation that leaves marks on a surface, the

lines created are both “memories of a motion” (Tufte & Druckrey, 2012) and portents of ideas yet to be concretized. I would also make a distinction between the way professional visual designers produce a sketch and the way others not accustomed to drawing or sketching produce one. A designer is more apt to make an abstract mark without first knowing what that mark means. It could be just an exclamation of “let’s just get started” and a way to generate initial cognitive feedback. The syntax that organizes these marks is not meant to be coherent nor does the actor need to have any drawing skills. This drawing or sketching is as much about seeing as it is creating. Drawing intensifies seeing (Tufte & Druckrey, 2012). Visual thinking informs a graphic design process as a formal artifact (e.g. technical diagram) it is at its heart a sensemaking activity, its job is to clarify and embody concepts (Ware, 2008).

The motive force behind the visual expression or rapid sketch is essentially non-linguistic. Its connection to other shapes and marks is not direct, nor linear. The grid, which is a critical organizational tool for a designer who produces two or three dimensional artifacts may not be as evident in the sketch. The natural forces that impact on the elements of a graphic depiction on a page still matter but do not need to be of concern to the “sketcher” for the sketch to be effective. This extra-linguistic nature of a visualization is in fact its most powerful feature. It can embody ambiguity and therefore be read to mean different things to different team members. It is like seeing shapes of real things in the abstraction of clouds.<sup>6</sup>

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<sup>6</sup> To help him discover novel ideas, Leonardo Da Vinci used this technique with a stained wall, seeing shapes and connections in the random tones of the stain. (McKim 1972)

With logic, rhetoric and pathos we build a case for a particular outcome. But why others choose to agree or disagree may in fact have nothing to do with either. The connections and influence between actors in a complex system is contextualized with biases, self-interest and uncertainty. The human condition prevails regardless of how rigid or even accommodating the system is. The intuitive begets the counter-intuitive. A contrary point of view, as part of a dialectical process, is necessary if we are to understand and accept the diverse needs of any stakeholder group. We have to be prepared to disrupt our own schemata while celebrating that of others.

If an environment of “comfort and safety”<sup>7</sup> ensures that the actors within an organization are free to speak their minds without censor then true play must also be encouraged. The play instinct (Rand 1985) is often delegated to a secondary or tertiary position behind a rigorous critical thinking process. True play has no rules and therefore cannot be taught. You can play a game that has a structure and you can even play it like it has never been played before (e.g. Gretsky and hockey). True play comes from invention, it lies outside the “game” itself, but it is not anything like gaming the system. True play is the genesis of a new game (Bogost, 2013). As soon it becomes a game, you will always be playing within a structure, a system of rules.

Productive discourse between disparate team members also needs to be playful and open to allow for serendipity, leaps of logic or abductive reasoning. The environment in which this happens must be supportive and comforting in order encourage the exchange of

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<sup>7</sup> participant quote, verbatim

deeper thought. It is at the confluence of purposeful activity and whimsical improvisation that we stumble upon the magic moment. A moment of clarity, a moment of surprise and elation, a moment of discovery. It is the “eureka” moment. It is that moment when everything comes together, is somehow aligned in our psyche and focuses our attention on a brand new insight. To be effective, multidisciplinary collaboration embraces all of the various perspectives at the table, to live in the problem-space with the ambiguity this will undoubtedly create and to tread lightly as you work through as many diverse ideas as possible. The bumps and messiness of a multi-disciplinary team dynamic is what makes it the best way to tackle complex problems that by definition have a similar complexion.

There is something innately reminiscent about this kind of collaboration. Nothing really goes as planned. We start with the idealized future and move towards it with the hope that the final outcome we build will closely resemble the picture on the model-kit box. We accept that it will not be exactly the same. Plans change because we change. Our motivations, desires, perspectives are in a constant state of flux. Those who refuse to bend or surrender some of their ideas for the sake of the whole are considered stubborn, contrarian or sometimes, absolutely visionary.

## **Idea Generation and Visual Stories**

What does the dementia journey “look-like” for people with this disease? This is the central question that guided my sensemaking and strangemaking of the original data and metaphor created by the Alzheimer Society of Ontario and partners. What does a light-hearted example of the shape of a fairy tale, Cinderella, as described by Kurt Vonnegut show us (Figure 31)? This is essentially just a sine curve, vacillating between positive and

negative poles. The “high” points in Cinderella’s life are very clearly depicted. The point at which the Godmother intervenes also clearly demonstrates a distinctly positive effect on Cinderella’s lifestyle, literally ratcheting her up into the realm of “good fortune.” This whimsical visualization is a powerful demonstration of how a simple vector can capture the essential qualities of a story plot.

We have to tell stories of our thoughts and revelations with our own voice. We can only express what we know or have learned in this way. This is a voice that is modulated by the intimate knowledge we have of our own area of expertise. We express ourselves with a myriad of techniques and styles, with pictures and words, with music and mathematics

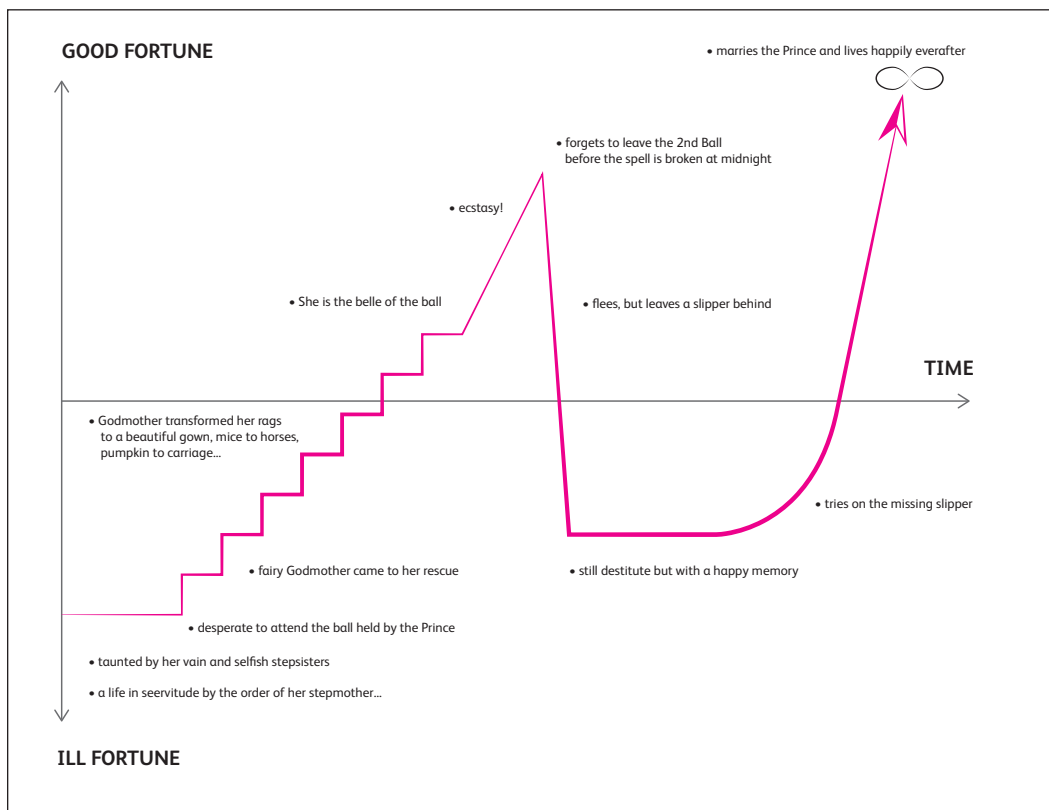


Fig. 31: The Shape of the Cinderella Fairy Tale as demonstrated by Kurt Vonnegut (“Vonnegut on the Shapes of Stories”)

with our passion and reason. The medium is anything you choose. Ideas are even embedded in our gestures. The timbre of our voice reflects tacit knowledge and a world-view. Our perspective is egocentric by nature but tempered by self-awareness. We are just one character in this story we tell. It should be open to the room so that the narration and structure is suggested and shared by the collective group. The plot is indeterminate and the conclusion fluid. The epilogue is also part of the narrative. It sets the scene for a new story based on the previous one. Our expression may take the form of an indecipherable sketch, a polished “artist’s rendering” or an eloquent presentation. It will be consumed and understood by our audience of stakeholders and peers discursively as well as synoptically. Not everything we express will resonate with everyone. In our problem-solving process we are free to use audio, animation and live action bits to tell our story. It does not always live on a wall as a picture or poster might, it can take up any three-dimensional space. It does not try to integrate data from other domains or disciplines but rather maintains a certain cacophony of information that teases both the eye and the imagination. These are the stories of our research. It encourages various levels of engagement and comprehension. It does not level the playing field, in fact it adds even more wrinkles, hills and valleys. Not only does it celebrate complexity it elevates it as an “object” for deeper contemplation for a wide range of stakeholders. Some passages are messy, some poignant and some just plain beige. The stories of our ideas are merely reflections of the way we perceive the life around us. A visual revelation of complexity is the insight to the comprehension of complexity (Tufte, 2006). It’s not a solution in itself of course, but it’s the first step towards getting closer to one.

# CONCLUSION

Holistic approaches to developing an organizational culture that supports and encourages creative discovery and innovation must include all of our senses. Any one sense cannot be considered more important or valuable than any other. Organizations that do not allow their members to ramble, free-form, sketch or play will not be as effective as developing new spaces for innovation as those that do. This is just the realization that the way people work, think and play cannot be mandated by managerial techniques that do not embrace the diversity of their human workforce.

Visual sensemaking artifacts appear to work best when their features are fully utilized in the first iteration, even at the expense of forcing the data into uncompromising positions. The inherent confusion that comes from a difficult metaphor may be the very reason one should play it out. The forced analogies may surface features or insights that would not have otherwise been considered if the data was always “allowed” to dictate its own frame. The power of the metaphor comes into the foreground when unexpected features collide with what is expected.

Random and rapid visualizations are just a type of *thinking-out-loud*. Its lack of structure or coherence may not be that appealing in a boardroom or a more formal meeting. It does however describe a creative problem-solving process very common in traditional advertising industry culture. The pre-occupation of these teams in the “creative” department is of course with the development of “strangemaking” artifacts rather than producing sensemaking ones. The space between the two is not as vast it may seem. Seeing data sets through the eyes of “strangemakers” who are accustomed to ambiguity may in fact yield very effective metaphor-frames for complex sensemaking problems



## **A New Occupation Destination for Visual Designers**

What is the future for graphic designers? Can their contributions to organizations as visual thinkers be made further upstream, where the problem space is the most complex?

Visual design, as a problem-solving methodology for the communication and branding industry, traditionally produces visual artifacts for the presentation and dissemination of information. These visual outcomes live as objects in static or dynamic digital spaces or as materialized expressions for identity systems, documentation, advertising, etc. The craft component of graphic design — the structured manipulation of form, color and context — naturally flourishes in the differencing or strangemaking industry of advertising and branding. By de-constructing this “crafting” aspect of design, by exploring its essence we uncover its sensemaking utility.

A visual designer can apply a thinking regime to a space that has nothing to do with the expressions of critical thinking outcomes. Results, findings, information and knowledge are only valuable when shared. Delegating the visual designer to the narrow task of dissemination and presentation of this knowledge with visual artifacts does not take full advantage of the deeper skill set that all visual designers possess.

Together, with the internal stakeholder groups, visual designers must expose their process to encourage creative discovery (Figure 32):

- 1. Facilitating the comprehension of complexity in a problem space through the visualization of ideas, by giving form and structure to information complexities and through the clarification and embodiment of concepts.**

## **2. Generating new connections between phenomena and data sets through the application of visual design principles.**

We need to design more objects that are good for thinking (Cross, 1982). These objects are not just charts or Venn Diagrams, they arise out of an amalgam of visual techniques that surface tacit knowledge through visualizations that capture both quantitative and qualitative data, that have both granular and “big-picture” features (Sevaldson, 2011) that embody the sensemaking and strangemaking skills of the visual designer. These visual design structures can be used as cognitive tools (mental models) to force novel connections between ideas and information to disrupt conventional thinking.

The sensemaking framework developed by van Patter (2013), as a progression of complexity in design domains, identifies the need for a new skill set for designers who will work outside the D1.0/2.0 categories (Figure 32). However, as van Patter critiques the differences between sensemaking and strangemaking, there was never a proposal for integrating these two necessary design processes in actual design practice, which I have shown here. The van Patter model also does not provide a window into the internalized design practices used by designers for sensemaking or strangemaking, which is a key purpose of this research. Both of these processes represent significant knowledge and skill development, and must be integrated for a coherent and visually evocative response to a complex challenge.

Designers are not only challenged with greater competition and change driven by globalization in the marketplace and the general commodification of their output, they must also evolve their skills to order to address problematic situations within complex organizational processes that involve large multi-disciplinary groups of stakeholders (D3/4).

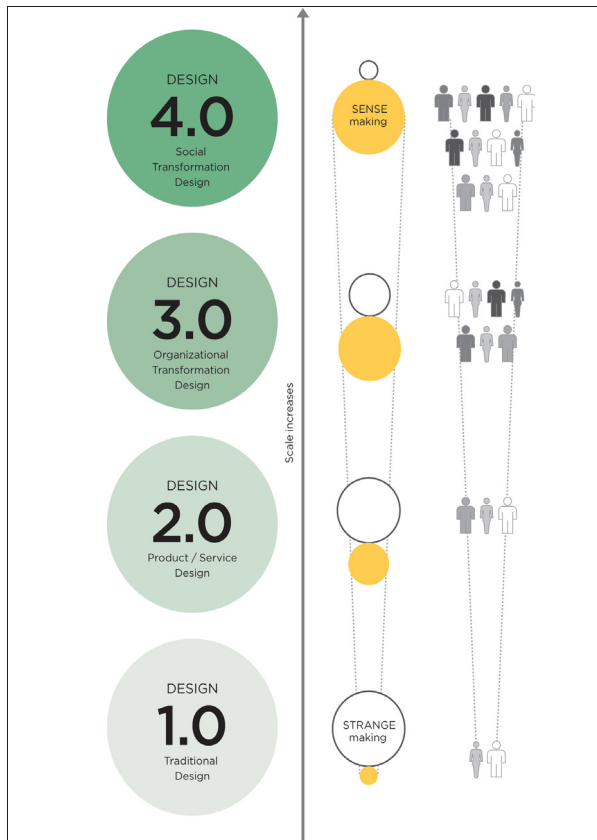


Fig. 32: Design geographies and complexity scale  
(Courtesy of Humantific)

Although these stakeholders operate in the upper levels of the DIKW structure and require a deeper sensemaking skill-set, the heart of a visual designers process is a full sensemaking-strangemaking cycle of activity with the potential to serve at other levels of complexities within the various domains of design.

### Coda

*From my years of experience in the workplace, too often visual designers get preoccupied with creating the next shiny new thing. They chase clients who encourage them to surpass the latest trend, to find new ways to tell the same old story. These clients and designers produce work that may do well at award shows but often just draws more praise and accolades from their peers than from their target audience.*

*We all want to be recognized for our efforts and someone still needs to sell dog food. The packaging matters, as does the TV spot and the interactive website and a myriad of other visual devices that make up that so-called integrated ad campaign. This work pays a lot of salaries and it is serious business. But what if these same designers put their process to work on more challenging problems? What would happen if they were to harness their power of strangemaking at the point it intersects with their brand of sensemaking and instead of producing things that look really cool, they produce things that provoke us to think? Not just to think to be contemplative, but to actually think hard about creative new ways to solve some very old, complex problems.*



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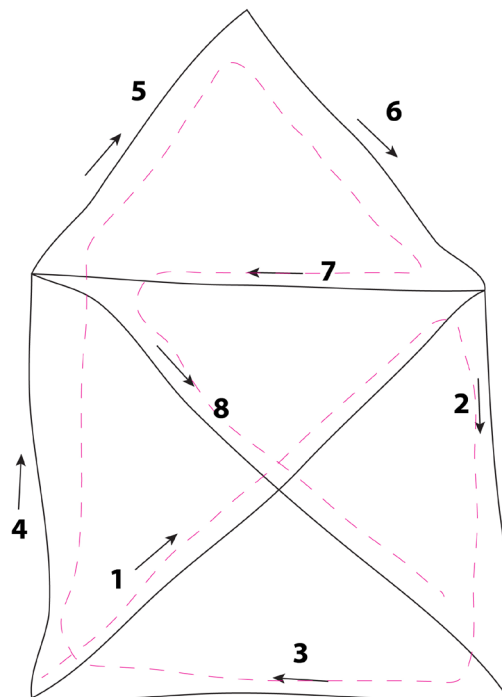
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# APPENDICES

## APPENDIX A

Solution to “House Sketch”: (McKim1972).



## **APPENDIX B**

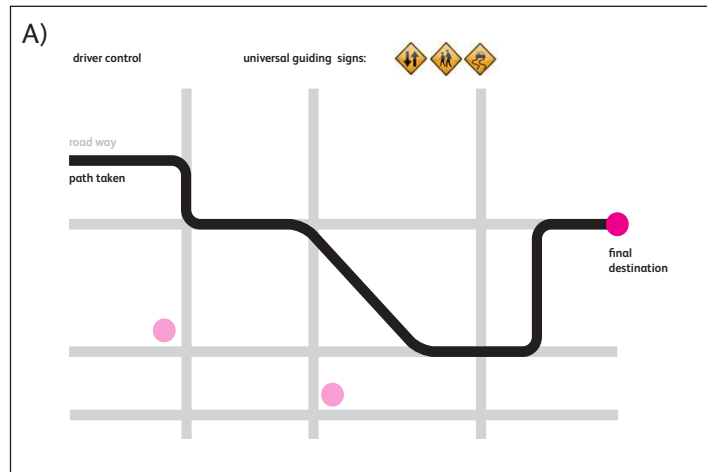
### **Interview protocol**

1. How do you refer to your work that you do?
2. What is your role?
3. Why is it important to you to do this kind of work
4. Do you have a particular process or methodology when you're faced with a problem-statements in the course of your day-to-day work?
5. What challenges do you find to be the most difficult in your role?
6. What do you find to be the most challenging in your role?
7. In your opinion, what are the most important aspects of a collaborative work sessions?
8. How are your work sessions structured? (i.e. facilitation, note taking etc)
9. In your opinion, is the most valuable work done in a session or individually?
10. Do you have any drawing skills?  
Are they used in your sense-making processes during shared work sessions?
11. What visual means do you use to convey your thoughts and ideas or to capture those of others in your team?

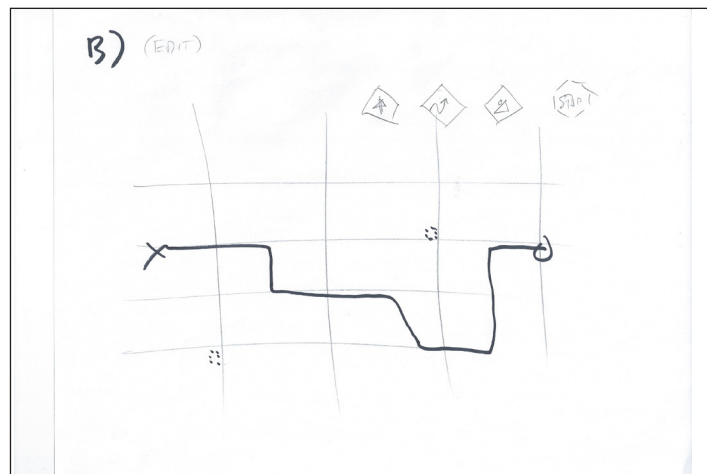
12. How often do you use photographic or illustrative material in your process?
13. Is there a dedicated team member or department that generates visual artifacts upon your request and guidance?
14. Do you express yourself better in writing or by speaking? ( or equally with both?)
15. Could you express a your state-of-mind in a sketch ?  
Is this uncomfortable or easy for you?
16. Do typical business graphics, such as flow chart, x-y graphs, pie charts etc appeal you?
17. Do you consider them to be essential tools for conveying information
18. How often are new insights reached while you're in a collaborative working session?
19. What triggers new ideas or ways at looking at a problem?
20. What is your process for re-framing problems?
21. Are you comfortable with abstract art or prefer art that is more representational forms?
22. How would you describe a successful project or outcome?
23. What is the most effective piece of work that you have done?

## APPENDIX C

Artifacts for comparison testing.



A) computer assisted rendering -



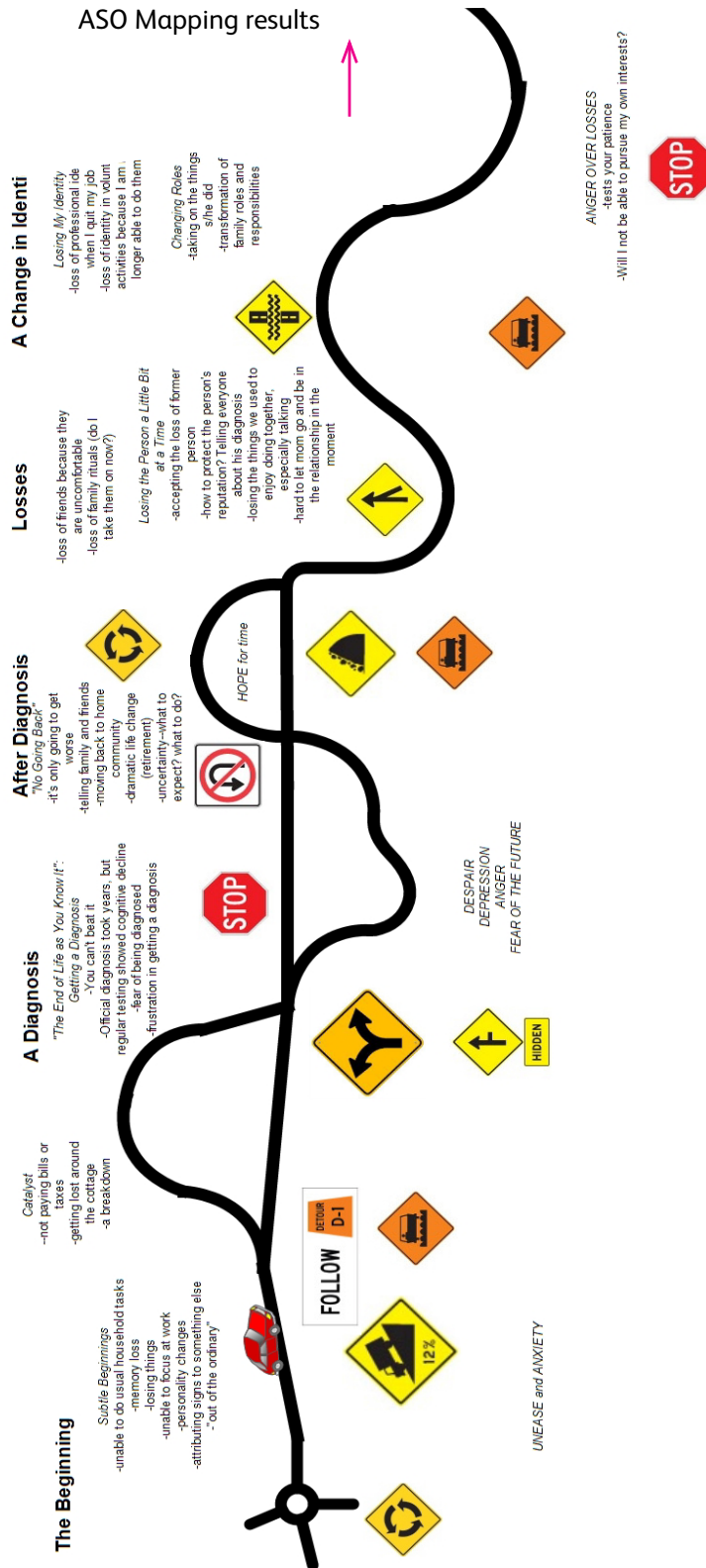
B) hand rendered - "quick sketch"

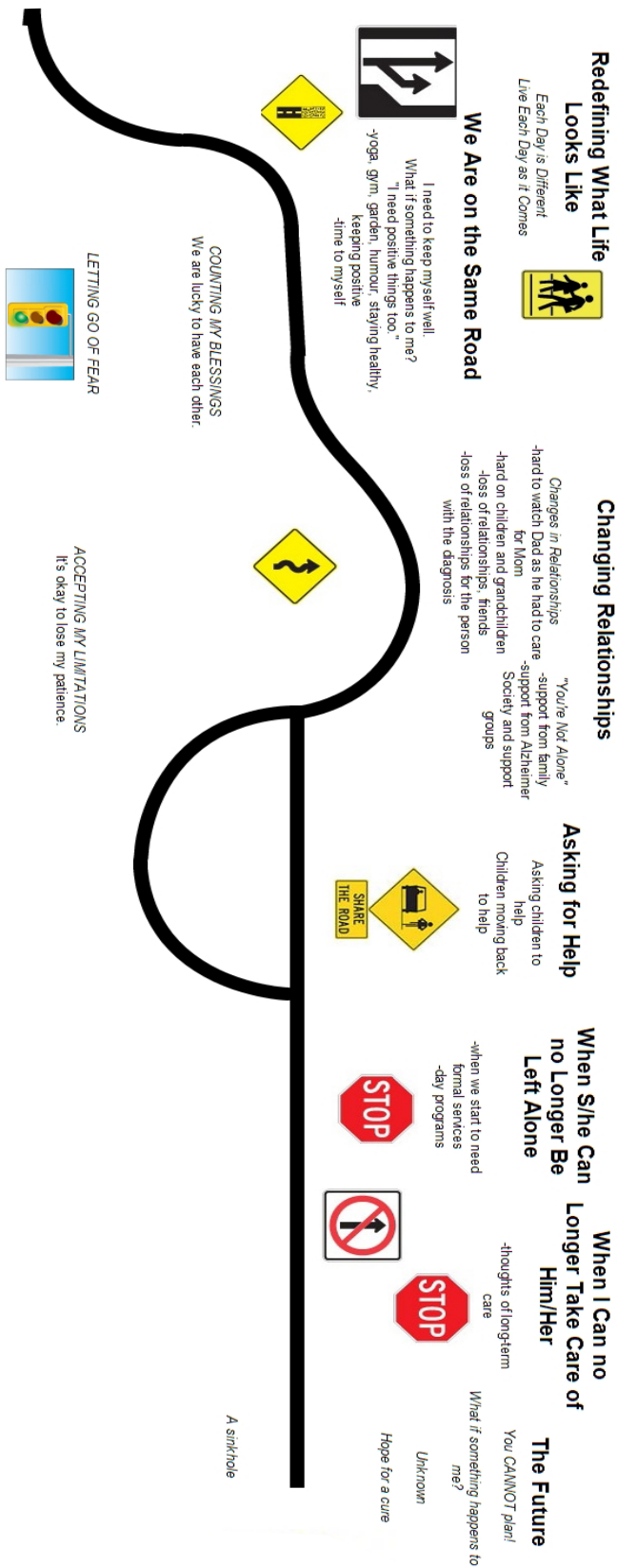


Stakeholder perspective:  
early partners in care, part a.

## APPENDIX D

### ASO Mapping results





Stakeholder perspective:  
 early partners in care, part b.

**The Beginning**

*Subtle Beginnings*

- unable to do usual household tasks
- memory loss
- repetition
- getting sent home from work
- attributing signs to something else
- "out of the ordinary"

**Catalyst**

- not knowing a word
- not recognizing a common item (green beans)
- sudden dramatic changes

**GO AHEAD**  
D-1

**FOLLOW**

**A Diagnosis**

*"I thought my world would cave in"*

- shock
- There is no cure
- happy to have a formal diagnosis
- feeling sorry for myself (here we go again... both my parents had it)
- got our affairs in order
- tension in the house was gone because we knew what it was
- we are all now moving in the same direction

**Impact on Children and Family**

- being there for the children and family too, while struggling

**ANGER, FRUSTRATION, and RESENTMENT**

- answering the same questions
- lack of empathy from my spouse
- doing everything on my own
- not aware of social behaviour
- I can't do the things I enjoy anymore
- "Will I ever be normal again?"

**GRIEF**

- loss of the life I thought we would have

**Adjusting to a "new normal"**

*Building a New Life*

- Letting go
- Hard work
- "Know Your Limits"
- Moving forward
- Live for today

**Go With the Flow**

- every day is different
- A disease of millimetres, adjustment by millimetres
- yield to change

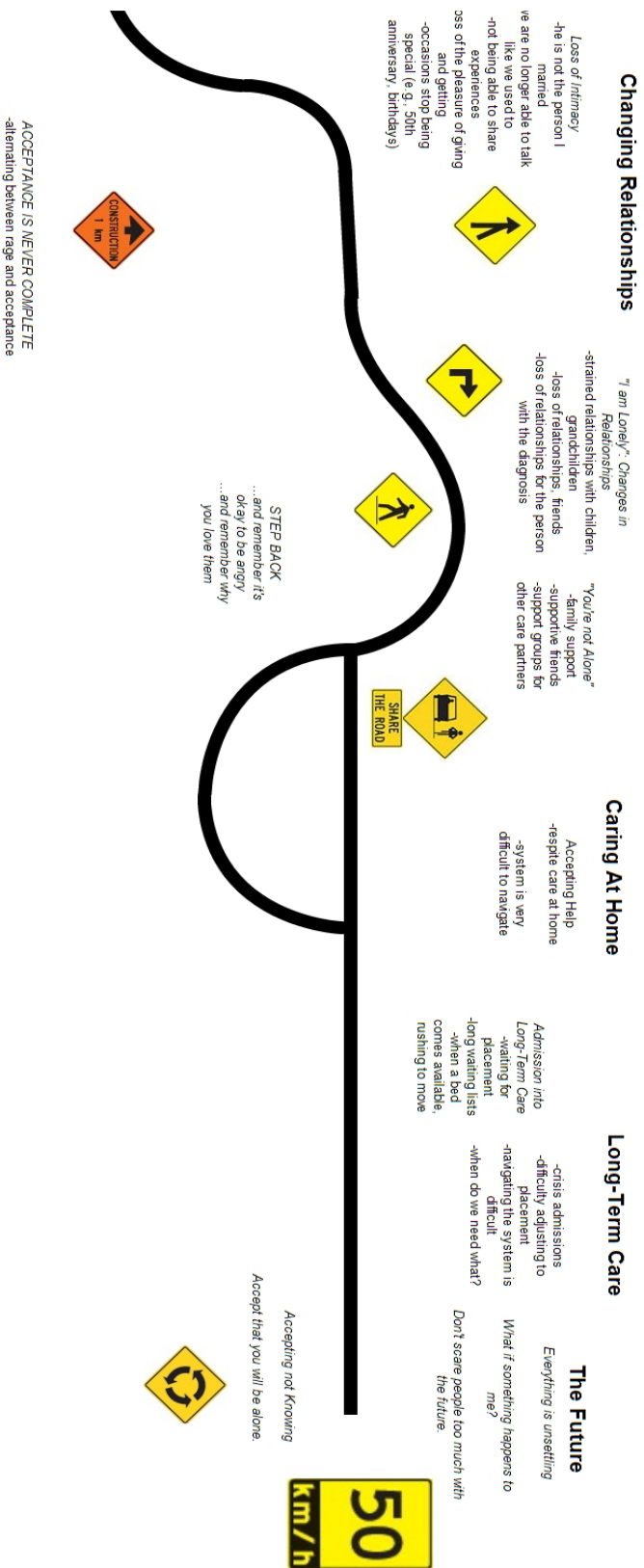
**Remaking Yourself**

- You have to change
- loss and change of identity-- we were once two people, now we are only one (1 brain between the two of us)
- It's amazing what you can do when you have to."

**A Changing Identity**

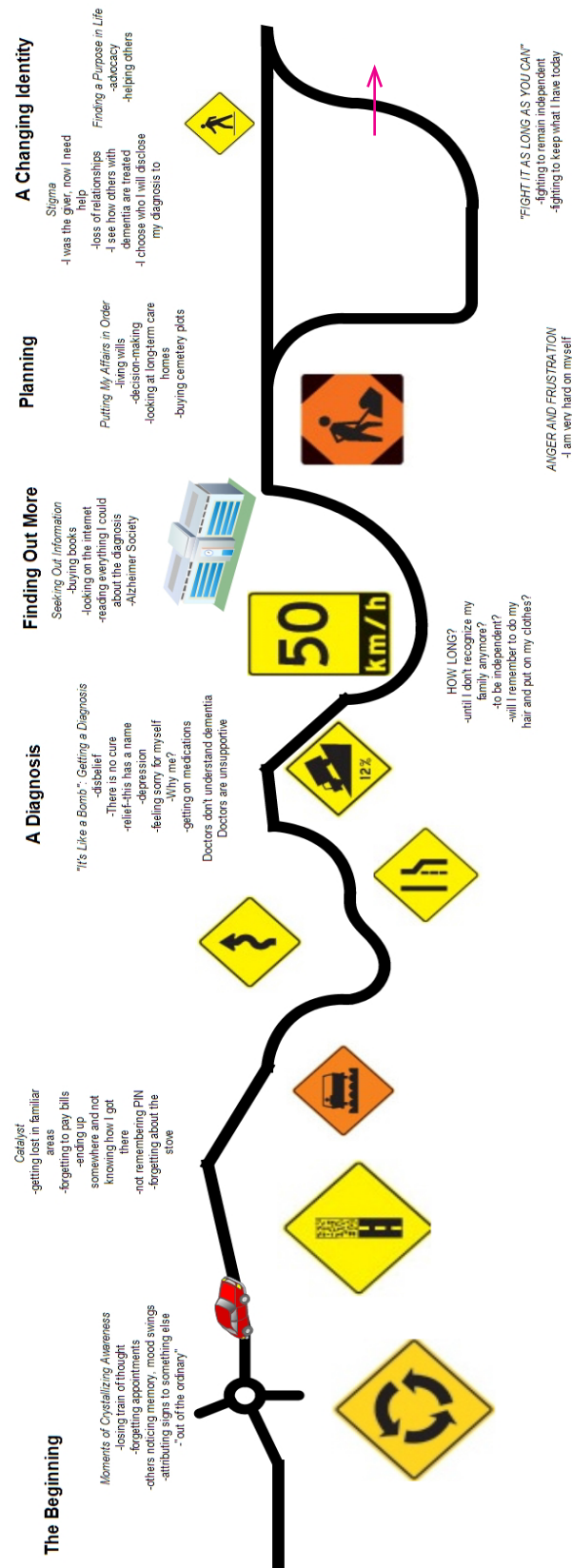
*GUILT*

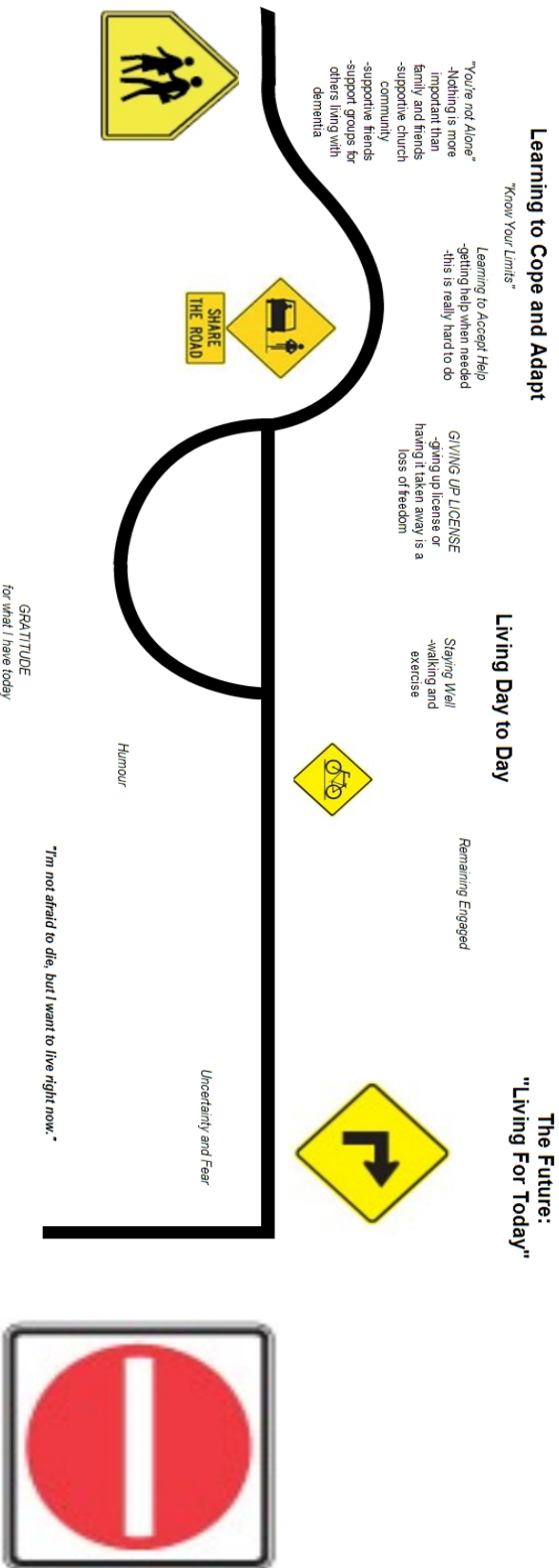
- not being able to keep him home
- over my own emotions and frustrations



Stakeholder perspective:  
late partners in care, part b.

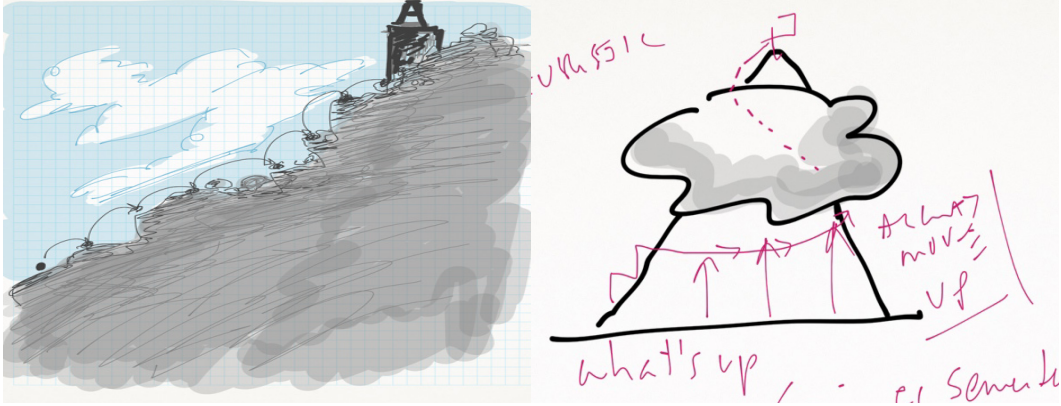
Stakeholder perspective:  
persons with dementia, part a





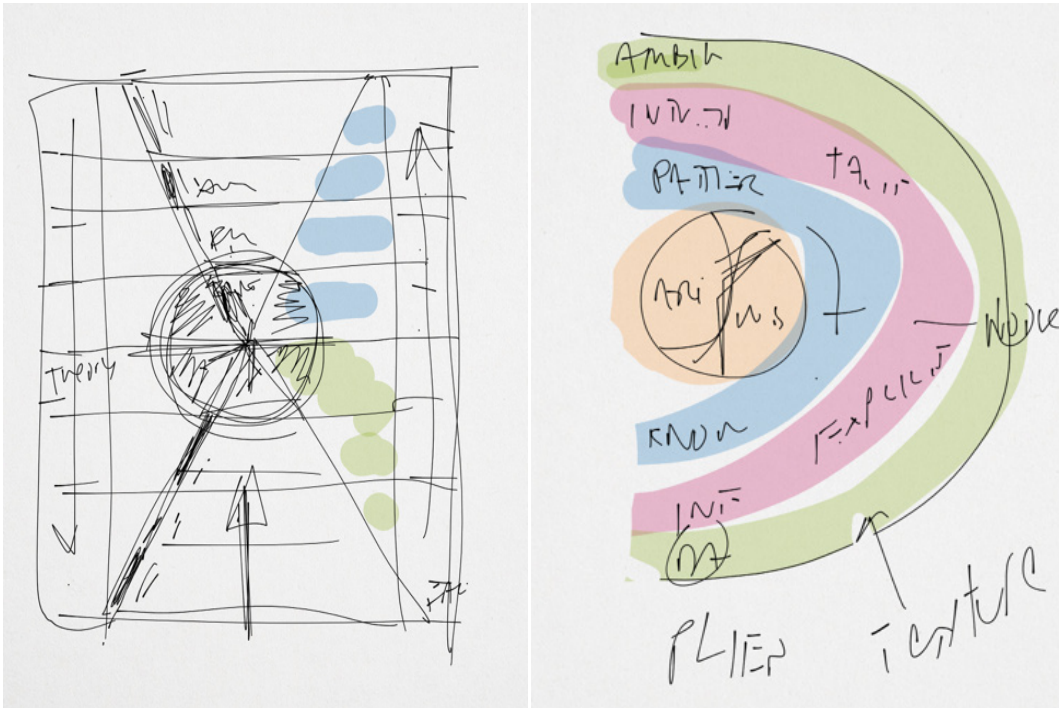
## APPENDIX E

Visual reflection on data, framing, Ackoff's Pyramid, synthesis



• the climb?

• shrouded process: moving between stages laterally?



• "proven" theories driving down, imagination rising up

• the other side of a "rational" process



Visual reflection on data, framing, Ackoff's Pyramid, synthesis

